SDMS Document
93279

SOURCES OF DIOXIN IN THE PRRI AREA

Prepared By:
TIERRA SOLUTIONS, INC.

September 4, 2002

Givaudan

APPENDIX J

Exhibits For:

GIVAUDAN-ROURE CORP.

September 4, 2002

932790003

J1

Givaudan Corporation

125 Delawanna Avenue | Clifton City | Passaic County

CATEGORY: Non-Superfund
State Lead

TYPE OF FACILITY: Manufacturing-Fragrances
OPERATION STATUS: Active

PROPERTY SIZE: 55 Acres

SURROUNDING LAND USE: Industrial/Residential

MEDIA AFFECTED	CONTAMINANTS	STATUS
Ground Water	Volatile Organic Compounds	Confirmed
Soil	Dioxin	Contained

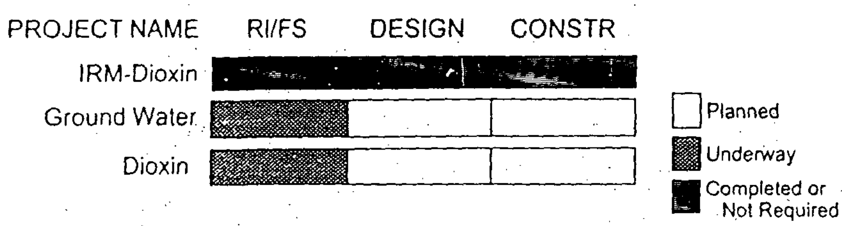
FUNDING SOURCE(S): Responsible Party

ACO SIGNED: 03/05/87
FINANCIAL ASSURANCE: $1.00M Posted

SITE DESCRIPTION/RESOLUTION OF ENVIRONMENTAL CONCERNS:

Givaudan Corporation is a fragrance manufacturing facility. Two separate Administrative Consent Orders (ACOs) were signed to remediate the dioxin and ground water contamination. The dioxin contamination is believed to have resulted from the use of 2, 4, 5-trichlorophenol (TCP) to produce hexachlorophene which is used in products such as medicated soaps. In July 1983, the limited dioxin-contaminated areas on the property were covered with tarpaulins and/or fenced to limit access. Extensive soil sampling was required to delineate the areas contaminated by dioxin. The dioxin contamination was completely delineated by April 1991 and the final dioxin Remedial Investigation (RI) Report was approved. A Feasibility Study (FS) to evaluate remedial alternatives was received in March 1992 and is currently under review by the New Jersey Department of Environmental Protection and Energy (NJDEPE). A Remedial Investigation (RI) Work Plan and Tank Closure Plan to address the ground water contamination was submitted to the NJDEPE in December 1991 and is also under review.

FOR FURTHER INFORMATION CONTACT: Site remediation Program
Bureau of State Case Management
609-633-0719



932790005

J2

Return to:
PASSAIC VALLEY SEWERAGE COMMISSIONERS
600 Wilson Avenue
Newark, N. J. 07105
(201) 344-1800

Date: 2 APRIL 1975

Plant Ref. No. ....

WASTE EFFLUENT SURVEY

(For Industries Served by the Passaic Valley Sewerage Commissioners)

Plant Name: GIVAUDAN CORP

Address: 125 DELAWANNA AVE, CLIFTON, NJ Zip 07014

Person and Title to whom any further inquiries should be directed:
ROBERT G WATTERS, PROJECT ENGINEER

Phone No.: 201-546-8530

Number of Employees: APPROX 750

Number of Working Days Per Week: NORMALLY 5 – SOMETIMES 6
YEAR 250

Number of Shifts Per Day: THREE (DAY SHIFT MOST ACTIVE ONE)

Area of Property: APPROX 52 Acres, or 2,236,000 Sq. Ft.

Type of Industry and 4 digit U. S. Standard Industrial Classification No.:
2818 – ORGANIC CHEMICALS

Finished Product(s): AROMA CHEMICALS & COMPOUNDED FLAVORS & FRAGRANCES

Average Production: 15,000,000 lbs/yr

Raw Materials Used: NUMEROUS ORGANIC AND INORGANIC CHEMICALS USED

Brief Description of Operations: OPERATIONS ARE GENERALLY OF TWO TYPES !
1. BLENDING & PACKAGING
2. ORGANIC CHEMICAL REACTIONS FOLLOWED BY PHYSICAL SEPARATIONS OF PRODUCTS & BY-PRODUCTS

932790007

ANSWER THE FOLLOWING QUESTIONS ONLY IF THE PLANT WASTE INCLUDES WASTE ATTRIBUTABLE TO INDUSTRIAL OPERATIONS

(Note: Analyses should be based on a 24-hour composite sample)

Characteristics of Plant Waste discharged to sanitary or combined sewer, after treatment if any. Indicate units of measure where applicable (e.g. Mg/l).

a) pH: 1.77 b) Turbidity: 185 JTU

c) Temperature: 16°C d) Radioactive? Yes ...... No ✓

e) Solids Concentration:

1) Total Solids 3,256 mg/l Volatile 853 mg/l Mineral 2,403 mg/l

2) Suspended Solids 82 mg/l Volatile 50 mg/l Mineral 32 mg/l

f) Oil and Grease Concentration:

1) Floatable Oils 1.4 mg/l

2) Emulsified Oils 34.0 mg/l

g) Chlorides 190 mg/l

h) Chemical Oxygen Demand (C.O.D.): 740 mg/l

i) 5-day Bio-chemical Oxygen Demand (B.O.D.): 500 mg/l

j) Total organic carbon (T.O.C.): 435 mg/l

k) Metallic Ions—Name and concentration (Important—list each metal in waste, e.g., chromium hex. and triv. Antimony, Lead, Mercury, Copper, Vanadium, Nickel; give concentration and total daily discharge of each metal.) LISTED AS mg/l → lbs/day

TRIVALENT CHROMIUM <0.095 → <1.7 ; HEXAVALENT CHROMIUM <0.005 → <0.1 ; ANTIMONY <1.0 → <17.

LEAD 0.2 → 3.5 ; COPPER 0.6 → 10.5 ; VANADIUM <0.2 → <3.5 ; NICKEL 0.4 → 7.0

MANGANESE 140 → 2,452

l) Toxic Material—Name and concentration e.g., cyanide salts, etc.):

CYANIDE < 6 μg/l MERCURY 14.5 μg/l

m) Solvents—Name and concentration: ISOPROPANOL 330 ppm

TOLUENE, HEPTANE, ACETONE, MEK, METHANOL — NOT DETECTED

n) Resins—Name and concentration (Lacquers, Varnishes, Synthetics): N/A

o) Date and time span of sample 3PM 10 MAR 75 to 3PM 11 MAR 75

Explain hours, method of discharge of waste to Sanitary Sewer and peak rate of flow, e.g., (continuing for 8 hours per day, 5 days per week at 100 gal./day rate) (batch twice a day for 20 minutes at 100 gal./min.) (Continuous 24 hours steady or with peaks at 2 P.M., peak rate 3 M.G.D.) etc.

CONTINUOUS 24 HR STEADY - AVERAGING 1.8 MGD WITH PEAK 2 TO 4PM APPROXIMATELY 2.5 MGD.

TOTAL DISCHARGE DURING SAMPLING PERIOD WAS 2.1 MGD

932790008

INTERNATIONAL
HYDRONICS CORPORATION
Box 910, R-4 PRINCETON, N.J. 08540 PHONE: (201) 329-2361

Date: March 25, 1975

Client: Givaduan Corporation, Mr. R. Watters
125 Delawanna Ave., Clifton, N.J. 07014

Received: March 10, 1975

Identifications & Data Supplied:

Job No.: 75-175-1

1 sample

Laboratory Analysis:

pH		1.77	Trivalent Chromium	(mg/l)	< .095
Turbidity JTU		185	Antimony	"	< 1.0
Temperature °C		16	Lead	"	0.2
Total Solids	(mg/l)	3,256	Mercury	(μg/l)	14.5
Volatile	"	853	Copper	(mg/l)	0.6
Mineral	"	2,403	Vanadium	"	< 0.2
Suspended Solids	"	82.0	Nickel	"	0.4
Volatile	"	50.0	Cyanide	(μg/l)	< 6.0
Mineral	"	32.0	Solvents:		
			Toluene	"	N.D.*
Oil & Grease:			Heptane	"	N.D.*
Floatable Oils	"	1.4	Acetone	"	N.D.*
Emulsified Oils	"	34.0	MEK	"	N.D.*
Chlorides	"	190	Methanol	"	N.D.*
COD	"	740	Isopropanol	ppm	330
BOD	"	500			
)C	"	435.0			
otal Chromium	"	< 0.1			
Hexavalent Chromium	"	< .005			
Manganese	"	140			

* Not Detected by Gas Chromatography

By: David L. Present

932790009

J3

PITNEY, HARDIN, KIPP & SZUCH
163 MADISON AVENUE
CN 1945
MORRISTOWN, NEW JERSEY 07960

MORRISTOWN (201) 267-3333
NEW YORK (212) 926-0331

TELEX 642014
TELECOPIER (201) 267-3727

NEWARK OFFICE
33 WASHINGTON STREET
NEWARK, NEW JERSEY 07102

(201) 623-1980

ROBERT P. HAZLEHURST, JR.
JOHN BARKER
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ROGER C. WARD
JAMES C. PITNEY
WILLIAM D. HARDIN
CLYDE A. SZUCH
S. JOSEPH FORTUNATO
WILLIAM H. HYATT, JR.
LAWRENCE F. REILLY
MURRAY J. LAULICHT
EDWARD P. LYNCH
GERALD C. NEARY
JOSEPH LUNIN
RICHARD L. PLOTKIN
TIMOTHY R. GREINER
ROBERT L. HOLLINGSHEAD
FREDERICK L. WHITMER
GREGORY C. PARLIMAN
ROBERT G. ROSE
JOSEPH H. KOTT
MARY LOU PARKER
PAUL E. GRAHAM
J. MICHAEL NOLAN, JR.
WARREN J. CASEY
KEVIN J. O'DONNELL

WRITER'S DIRECT
DIAL NUMBER
(201) 631- 4841

July 26, 1983

Mr. Michael F. Catania
Director
Department of Environmental Protection
Office of Regulatory Services
CN 402
Trenton, New Jersey 08625

RE: Givaudan Corporation

Dear Mr. Catania:

The purpose of this letter is to respond to your June 20, 1983 letter request for information, as clarified in our July 20, 1983 conference in your offices. For convenience, each of the categories of information you requested in your June 20, 1983 letter will be set forth, followed by the information we understand will be responsive to your needs. In each case, the information is complete to the best of our knowledge and information.

"The history of chemical production processes at the facility, with particular emphasis on the production of trichlorophenol and hexachlorophene."

Enclosed are lists of products produced by the Company at its Clifton, New Jersey facility. Attachment A lists such products produced during the period from 1924 through 1972. These lists are contained on forms which also include information about production levels which we have deleted because we regard that information as proprietary and because we understand you do not need that information for your purposes. Since similar product lists are not available in this format for the period from 1973 to 1983, we have prepared a list of current products (Attachment B) and lists of products at five year intervals for 1978 (Attachment C) and 1973 (Attachment D). These five year product lists are representative of products produced by the Company at its Clifton, New Jersey facility during each of the five-year periods and contain all products in which we believe you would be interested for purposes of your current investigation.

2,4,5-Trichlorophenol was manufactured by the Company in Clifton during the years 1947, 1948 and 1949. To the best of our knowledge, all this production occurred in Buildings 54 and 60.

Industrial production of Hexachlorophene started in 1947 and has continued since then in Buildings 58, 59 and 60. Additionally, during the years 1970, 1971 and 1972 Hexachlorophene was also produced in Building 9. Grinding and packaging of the final product has been performed in Buildings 47, 75 and 75A.

> "The history of operations at this site by Givaudan or any other party, including any unusual occurrences such as accidents, fires, explosions, etc."

Enclosed is a two-page written summary entitled "History of Site Presently Occupied by Givaudan Aromatic Chemical Plant", (Attachment F) prepared by G. F. Talarico, dated July 5, 1983. Also enclosed is a complete list of fires, explosions and accidents at the Company's facility since 1960, (Attachment G) prepared by W. Turetsky.

> "A summary of the solid and hazardous waste and waste water disposal practices and facilities, including a listing of the haulers of this waste and the final disposition thereof."

Enclosed as Attachment H are two attachments, numbered 1 and 2, entitled, respectively, "Hexachlorophene Process: Off-Site Disposal Activities" and "Waste Sent Off-Site for Disposal 1975-1983". In addition, hazardous waste manifests maintained in accordance with your regulatory requirements, are available for your inspection. The records prior to 1975 do not specifically identify the materials shipped or the disposal site but do identify the contractor used.

"An identification of all suppliers of trichlorophenol used or stored at the facility, including the time frames for each supplier."

Enclosed as Attachment I is a list identifying all suppliers to the Company of trichlorophenol, including the time frames for each supplier.

"A summary of analytical testing for dioxin contamination of trichlorophenol produced at the facility or purchased from other sources, as well as hexachlorophene or other finished products."

Enclosed are Attachments J and K, dated, respectively April 19, 1983 and June 24, 1983, reporting analyses of 2,4,5-Trichlorophenol for TCDD performed by the Company's research labs and for the Company's quality assurance department by California Research Labs. Enclosed is Attachment L which is an affidavit dated July 22, 1983, summarizing the results of analysis of Hexachlorophene for TCDD. No other products were tested for TCDD as there is and has been no reason to suspect any such contamination.

"A summary of demolition activities which have occurred on-site, including an indication of the activities which were formerly conducted in any demolished buildings, and identification of any demolition contractor(s) who performed this work, the final disposition of the resultant rubble, and a listing of the source, description and present location of any fill materials which may have been placed on-site subsequent to such demolition."

Enclosed is Attachment M which is a two-page written memorandum dated July 25, 1983 with two pages of attached exhibits describing demolition activities at or on the Company's facility in Clifton, New

Jersey. To the best of our knowledge, this memorandum describes all such demolition activities with the exception of the demolition of the residences north of Delawanna Avenue, described in the next section of this letter.

You have also requested that we provide you with information concerning the production history of the portion of the Company's facility north of Delawanna Avenue. No operations have occurred, to the best of our knowledge, in that portion of the Company's facility involving any chemical synthesis. For purposes of advising you of the history of that portion of the Company's facility, we have, for convenience, divided the area into segments east and west of Colorado Street. A plot plan depicting the area north of Delawanna Avenue is enclosed as Attachment E.

With respect to the area east of Colorado Street and north of Delawanna Avenue, there were, until 1968, three residences which stood in the area now occupied by Building 100 (the main headquarters building). Those residences were demolished in approximately 1968 and construction of Building 100 began in 1969. Prior to 1970 (at least as far back as 1956), Building 105 was owned by the Bergen County Express Co. Building 105 was purchased by the Company in approximately 1970 and, during the period from 1970 to 1974, was leased to Bergen County Express Co. for use as a warehouse. In 1974, with the approval of the Food and Drug Administration, the Company established a Flavor Center in Building 105 which has been used for that purpose since then. It is used for the mixing and drying of flavors. In 1976, Building 105 was expanded by the addition of approximately 38,000 sq. ft. of useable space to allow for the installation of an additional drier as well as providing additional warehouse space.

Building 102 was built in approximately 1959 and has been used since then by (a) Monarch/Premier Albums, a manufacturer of record albums, (b) a company called Gemini, a manufacturer of mailboxes and antennas and (c) a company called Bermas, a plastics manufacturer and Quaker Fabric Corp., a knitting mill which continue to occupy this building.

Building 106 was built in approximately 1959 and was used until 1975 as a lumber storage facility by Weyerhauser. From 1976 to 1982, the Company used Building 106 for warehousing and storage of flavor ingredients. This building is now empty and available for rent.

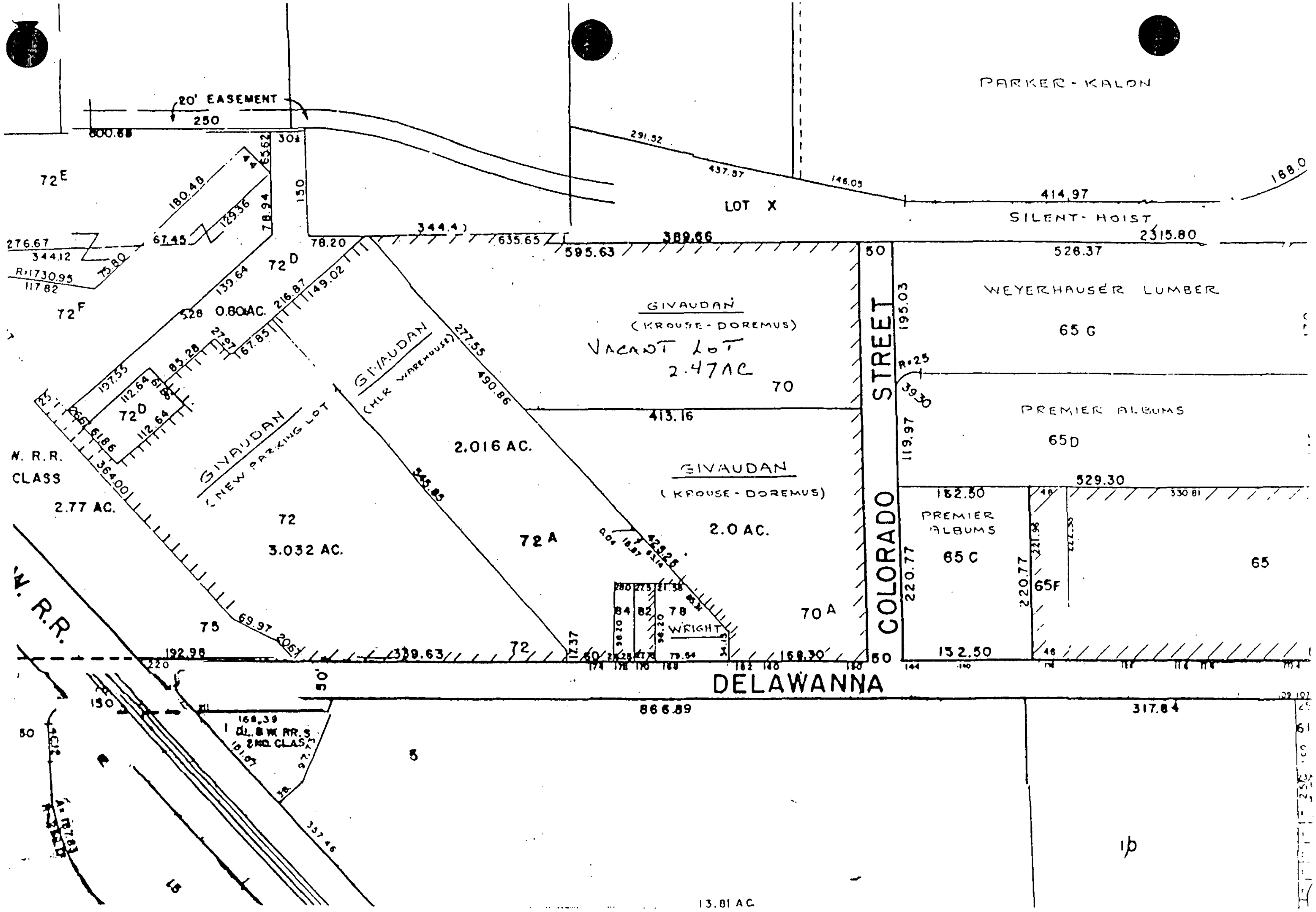
With respect to the area of the Company's facility west of Colorado Street and north of Delawanna Avenue, during the period from 1946 until 1966, there was a brass and aluminum castings foundry, operated by a company known as Krause-Doremus which may also have conducted limited operations during the period from 1966 to 1969. From 1969 to 1971, the building which had housed the Krause-Doremus foundry was vacant and was demolished in 1971. There was a second, vacant lot also associated with the Krause-Doremus foundry. In addition, there were three residences which the Company successively acquired between 1968 and 1970, all of which were demolished in or about 1970. Also located in that area of the Company's facility is Building 103, now used for fragrance compounding. As early as 1916, the buildings were used, we understand, as an oil cloth factory. In 1946, the buildings were purchased by Hoffmann LaRoche which designated them as "Building 72" and "Building 72-A". "Building 72", demolished in 1969, was used for mixing and warehousing of vitamins. "Building 72-A" now known as Building 103, was used for the warehousing of vitamins until 1969, when the building was acquired by the Company for use in fragrance compounding. No Hexachlorophene was ever produced, compounded or otherwise used in the facilities on the north side of Delawanna Avenue.

We trust you will find this letter responsive to your inquiry of June 20, 1983, but if you need further information, please contact me.

Very truly yours,

WILLIAM H. HYATT, JR.

WHH,JR/mc
Encs.
cc: Mr. Jon Christensen
Mr. Armin Kessler



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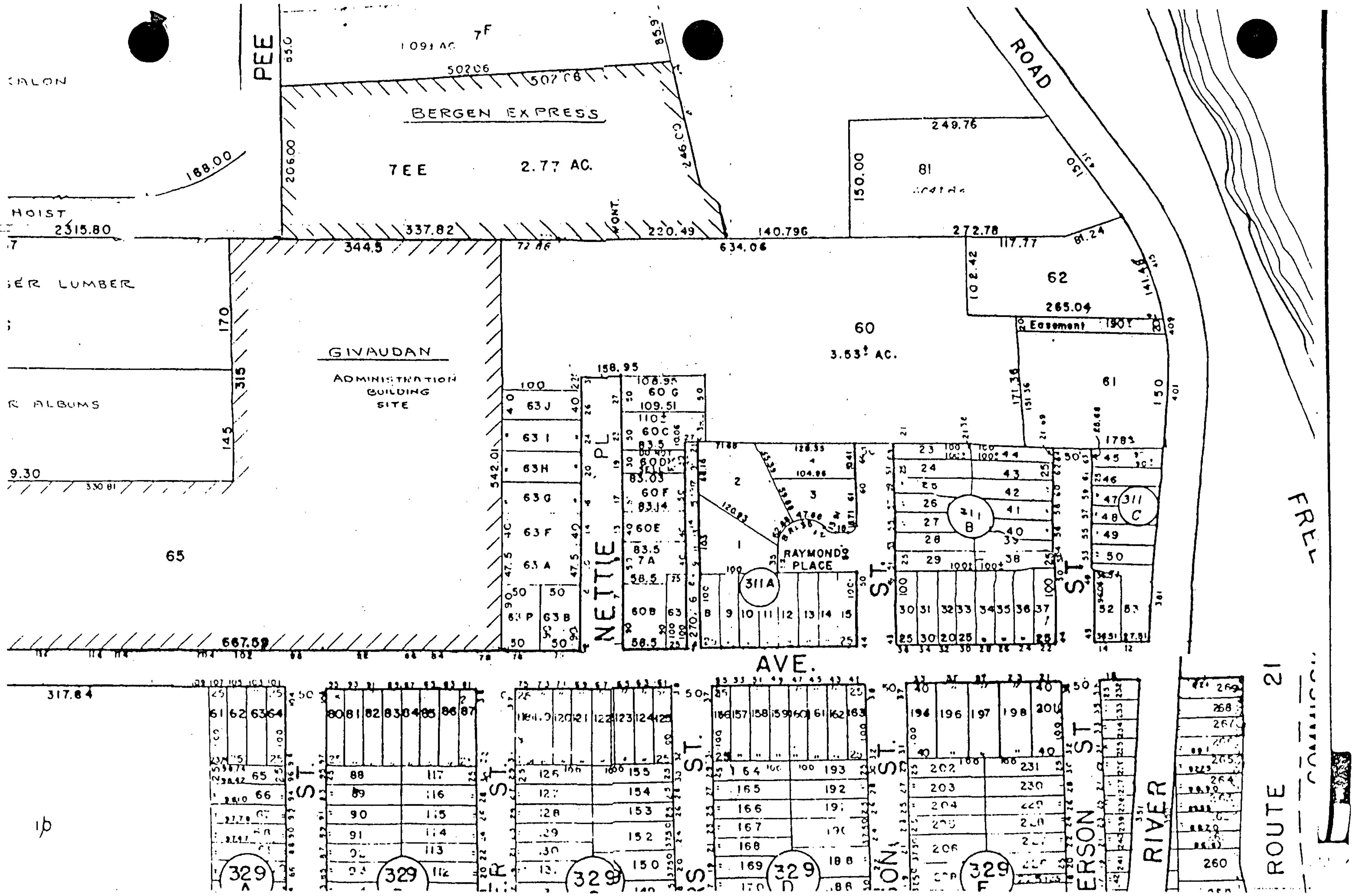
Attachment (E).



Prior to 1970

932790017

GIVAUDAN CORPORATION
100 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable: Givaudanco, Clifton
Telex: 138901

September 1, 1983

Dr. Jorge Berkowitz, Acting Administrator
Hazardous Site Mitigation Administration
State of N. J. Dept. of Environmental Protection
Division of Waste Management
8 East Hanover Street
CN 028
Trenton, N. J. 08625

Gentlemen:

The following is supplementary information regarding the operations conducted in Bldg. 103 (174 Delawanna Ave.) and Bldg. 105 (2 Peekay Drive), the compounding and mixing operations north of Delawanna Ave:

A) General

Both of these buildings are regularly inspected by the N. J. State Department of Health. A copy of their latest inspection certificate issued following Ms. Navitski's inspection on May 16, 1983 - is attached. To the best of my knowledge neither trichlorophenol nor hexachlorophene has ever been stored, handled or prepared in either of these buildings or in the areas surrounding these buildings which are enclosed by perimeter fences.

B) Bldg. 103

Since 1976 , Bldg. 103 has been used for compounding fragrance oils. In this building are stored several thousand synthetic and natural products. These materials are blended together in exact proportions according to written (actually computer generated) formulae to obtain homogeneous solutions in batch sizes ranging from 1 to 24,000 lbs. In a typical batch, a solvent (such as phenylethyl alcohol or dipropylene glycol) is pumped into a stainless steel tank followed by the addition of various solid or liquid fragrance materials. This mixture is then agitated until a homogeneous solution is obtained. There are no chemical reactions done in this building.

continued

C) Bldg. 105

Since 1974, Bldg. 105 has been used to prepare flavor compounds using materials which are listed by the Flavor & Extract Manufacturers Assoc. (FEMA) as GRAS (Generally Regarded As Safe).
The products prepared in this building are of several types:

1. Liquid flavor compounds- solutions of various synthetic and natural materials which have been blended together.

2. Flavor blends- powdered flavors which are obtained by mechanically mixing a) several powdered flavors together or b) a liquid flavor component with a powdered flavor component (or carrier such as xanthan gum).

3. Natural flavor extracts- these are obtained by treating various natural products (e.g. citrus oils, cocoa powder, nuts, plant products) with a solvent (usually ethyl alcohol) to obtain an an extract which is then concentrated.

4. Spray dried products- emulsions are prepared containing a liquid flavor component, a carrier (such as Capsul, Morex, Dextrin) and water. This mixture is passed through a spray dryer by which process water is evaporated and a powdered flavor obtained.

D) EPA

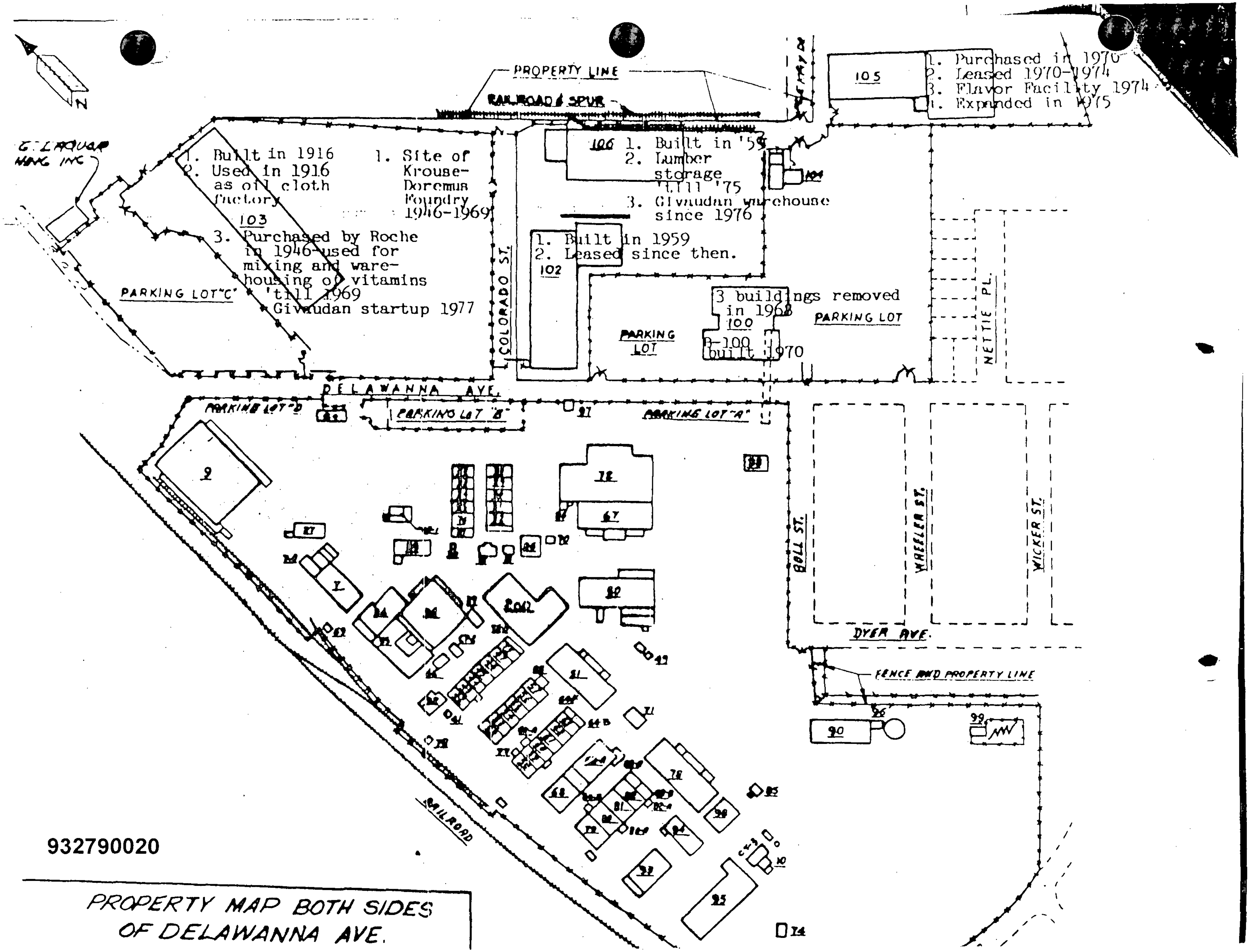
The EPA conducted sampling around the perimeter of the Chemical Plant (125 Delawanna Ave.) and found all samples non detectable for TCDD.

Sincerely,

GIVAUDAN CORPORATION

John Rankin WST

John A. Rankin



932790020

PROPERTY MAP BOTH SIDES OF DELAWANNA AVE.

J4

Givaudan Corporation

Clifton, New Jersey
Delawanna Avenue Facility

NJDEP APPROVED

TCDD INVESTIGATION REPORT
AND
LIMITED INVESTIGATION REPORT

JANUARY 1991

Prepared For:

GIVAUDAN CORPORATION
125 DELAWANNA AVENUE
CLIFTON, NEW JERSEY 07015

Prepared By:

Environmental Resources Management, Inc.
855 Springdale Drive
Exton, Pennsylvania 19341

BPA0000[illegible]0

NJDEPE APPROVED
TCDD INVESTIGATION REPORT 01/91
&
LIMITED TCDD INVESTIGATION REPORT 7/12/90

SECTION 2
ENVIRONMENTAL SETTING

2.1 Physiography

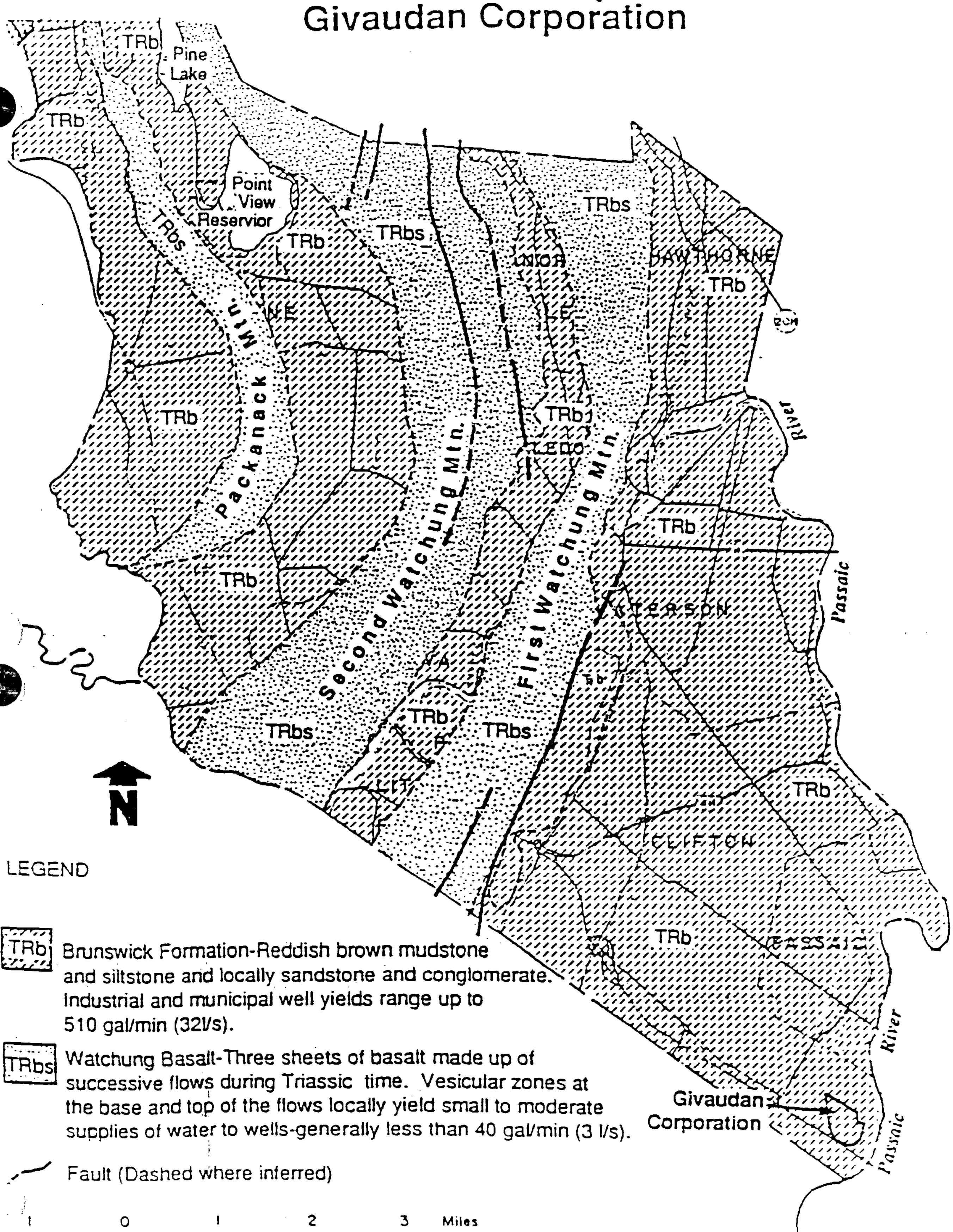
Givaudan Corporation's Clifton, New Jersey, plant is located on Triassic Age (240 to 250 million years old) lowlands of the Piedmont Province in the Appalachian Highland Physiographic Division. The Piedmont Province consists of gently rolling hills and broad valleys. Altitudes in the area range from near sea level along the Passaic River to several hundred feet in the First and Second Watchung Mountains west of the Site. The gentle topography is the result of Holocene (recent) sedimentation and Pleistocene (2 million to 100,000 years ago) glaciation (i.e., Wisconsin stage) along the Atlantic Coastal Plain.

The Site is located in the Passaic River valley. The Passaic River watershed is a contorted, dendritic drainage system that flows generally northwest to southeast, where it ultimately discharges to Newark Bay. The drainage system is the result of glaciation, which altered the pre-glacial dendritic drainage system.

2.2 Regional and Site Geology

The Site is primarily underlain by the Brunswick Formation, the youngest lithologic unit of the Late Triassic Stage Newark Group (Figure 2-1 and Table 2-1) (Carswell and Rooney, 1976). The

Figure 2-1
Geologic Map
Givaudan Corporation



LEGEND

TRb Brunswick Formation-Reddish brown mudstone and siltstone and locally sandstone and conglomerate. Industrial and municipal well yields range up to 510 gal/min (32l/s).

TRbs Watchung Basalt-Three sheets of basalt made up of successive flows during Triassic time. Vesicular zones at the base and top of the flows locally yield small to moderate supplies of water to wells-generally less than 40 gal/min (3 l/s).

Fault (Dashed where inferred)

0 1 2 3 Miles

0 1 2 3 4 5 Kilometers

Source: Carswell and Rooney, 1976

The ERM Group

932790024

Table 2-1
Summary of Geology and Hydrogeology of the Newark Group and Wisconsin Age Glacial Deposits
Givaudan Corporation

Group	Age	Formation	Lithologic Description	Water Bearing Characteristics
Undifferentiated Glacial Deposits	Pleistocene Period-Wisconsin Stage	Un-named	Unconsolidated stratified and unstratified clay, silt, sand, and gravel ranging in thickness from 0 to 250 feet.	Poor to very poor water producing zones due to coarse grained units with a high fine grain fraction.
Newark	Late Triassic	Brunswick	Consolidated shales, sandstones, and some conglomerate ranging from several thousand to > 16,000 feet thick.	Generally poor to moderate water bearing capacity but may be extreamly high in highly fractured areas
		Lockatong	Lacustrine deposits of detrital cycles of mudstone and chemical cycles of anticline and argillite ranging from 500 to 3750 feet thick	Unknown in study area
		Stockton	Well sorted arkose and subordinate conglomerate and mudstone approximately 1000 feet thick near the site	Unknown in study area

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Newark Group is contained in a southwest trending basin that reaches from Rockland County, New York, to northeast Lancaster County, Pennsylvania. The Newark basin is the largest of three basins included in one of six major Triassic rift valleys that run in a sinuous belt for more than 1,000 miles from Nova Scotia to South Carolina. These rift valleys formed as a result of tensional stress along the Atlantic coast, which caused downward normal faulting (King, 1977).

The Newark Group consists of 16,000 to 20,000 feet of non-marine sedimentary rocks and associated intrusive and extrusive igneous rocks deposited in the Triassic rift valleys from Paleozoic source rocks to the northwest. The lowest member is the Stockton Formation, which consists primarily of light yellowish grey to pale reddish brown well-sorted arkose and subordinate conglomerate and mudstone. The Stockton Formation ranges from 6,000 feet thick in the southern portion of the basin (southeastern Pennsylvania) to approximately 1,000 feet thick near the site. The Stockton Formation is conformably overlain by the Lockatong Formation, a large lacustrine lens that ranges from 3,750 feet in the center of the basin to 500 to 750 feet in the subsurface west of Staten Island. The lowest part of the Lockatong Formation consists of micaceous mudstone with subordinate fine-grain sandstone. The Lockatong grades conformably upward into the reddish brown Brunswick Formation through a series of grey pyritic shale and mudstone detrital cycles alternating with chemical cycles of grey analcime and carbonate rich argillite.

The Brunswick Formation consists of a thick sequence of interbedded brown, reddish brown and grey shale, sandy shale, sandstone and some conglomerate. The thickness of the Brunswick Formation is estimated to range from greater than 16,000 feet in the southwest portion of the basin to several thousand feet thick in the study area. The lithology of the Brunswick consists primarily of claystone and siltstone, but in the northern portion of the basin, the Upper Brunswick grades into more coarse-grain sandstones and becomes conglomeratic in some areas (Nichols, 1968). Bedding planes generally strike in a northeast direction, and structural dip is between 10° and 30° northwest (Vecchioli, et al., 1969).

2.3 Regional and Site Soil Characteristics

The natural soils at the Site are primarily coarse-loamy materials to depths in excess of 5 feet. The Site soils are part of the Urban-Land Riverhead Complex, as classified by the United States Department of Agriculture Soil Conservation Service (USDA, 1975).

Urban land consists of areas where man has altered the soil and extensive areas are under paving or structures. The Riverhead Complex consists of a 3 to 4-inch topsoil zone having a moderate gravel and cobblestone content. Below approximately 3 inches, sand and gravel become common. The soils are stable, with a relatively moderate water intake rate. Soil permeability is described as moderately rapid (2.0 to 6.0 inches per hour) at the surface and rapid (6.0 to 20 inches per hour) in the subsurface.

2.4 Demography

The City of Clifton has a population of approximately 78,000 of which a large percentage is white collar middle class. Population during the last decade has been declining slightly and is currently static. The lack of population growth is attributed to the area being nearly developed (94 percent). In addition to a low growth rate, the population flux is also low because families are not moving from, or to, the area (City of Clifton Planning Commission, personal communication, 1988).

2.5 Land Use

Approximately 94 percent of the land available in the City of Clifton is currently urbanized. Of this, approximately 22,000 parcels of land are developed as residential and 3,000 parcels developed as commercial or industrial. No land is used for farming or natural resource exploitation.

2.6 Climatology

The northern New Jersey area is characterized by cold winters and warm summers typical of a continental climate. Normal high temperature for July is 85.5°F, and normal low for January is 24.2°F. Normal precipitation is 42.34 inches of water per year, of which 29.1 water-equivalent inches occur as snow or ice. The prevailing wind direction varies from the northwest during the early part of the year to the southwest during the late summer and early winter months. Major precipitation events common during the fall and winter months are storms originating off the Atlantic Coast (northeasters), which commonly produce 1 to 2 inches of precipitation and last 24 to 48 hours. The growing season at low elevations east of the Watchung Mountains usually runs from mid-April to late October or early November.

SECTION 4
SITE INVESTIGATION RESULTS

4.1 Contaminated Non-Process Area

4.1.1 21-22 May 1988 Sampling Program Results

During the May 1988 sampling program, a total of 132 soil samples were collected (Table 4-1). The samples were analyzed using a selective approach as described in Section 3.1.1. Of the 46 samples analyzed, 36 samples (78 percent) had TCDD concentrations below 1 ppb, 8 samples (17 percent) had TCDD concentrations ranging from 1 to less than 7 ppb, and 2 samples (less than 5 percent) had TCDD concentrations in excess of 7 ppb (Appendix C).

4.1.2 19 November 1988 Sampling Program Results

During the November 1988 sampling program, a total of 214 samples were collected (Table 4-1). Samples were analyzed using a selective approach as described in Section 3.1.1. Of the 80 samples analyzed, 57 samples (71 percent) had TCDD concentrations below 1 ppb, 19 samples (24 percent) had TCDD concentrations ranging from 1 to less than 7 ppb, and 4 samples (5 percent) had TCDD concentrations in excess of 7 ppb (Appendix C).

TABLE 4-1

RESULTS OF 1988-1989 FIELD INVESTIGATIONS

Sample Date	Total Locations	Samples Taken	Samples Analyzed	TCDD Concentrations [1]		
				<1.0	1.0-7.0	> 7.0
2/20/88	1	3	3	3	-	-
5/21/88	15	95	43	33	8	2
5/22/88	5	36	16	14	1	1
11/19/88	46	214	80	57	19	4
3/18/89	58	111	65	33	28	4
TOTALS	**125**	**459**	**207**	**140**	**56**	**11**

NOTES

1 - All TCDD concentrations reported in parts per billion (ppb)

4.1.3 18 March 1989 Sampling Program Results

During the 18 March 1989 sampling program, a total of 58 samples were collected (Table 4-1). Samples were analyzed using a selective approach as described in Section 3.1.1. Of the - 65 samples analyzed, 33 samples (51 percent) had TCDD concentrations below 1 ppb, 28 samples (43 percent) had TCDD concentrations ranging from 1 to less than 7 ppb, and 4 samples (6 percent) had TCDD concentrations in excess of 7 ppb (Appendix C).

4.2 Contaminated Process Area Results

At the time of the ACO execution, the Contaminated Process Area was defined as depicted on Drawing A-9565 Revision 2. After conducting the field activities and investigations under the Amended ACO described in Section 3.2, three soil samples were analyzed for TCDD. The results of these analyses (Appendix C) indicated that samples G-11, 36-1, 36-2, and 36-3 had TCDD concentrations below 1 ppb (Table 4-1). Therefore, on 4 April 1988 NJDEP approved redefinition of the Contaminated Process Area boundary (Appendix B) as depicted on Givaudan Drawing A-9565 Revision 3.

To further verify this new delineation, an additional soil sample was collected at the corner of Building 42 (LL-20). This sample had TCDD concentrations below 1 ppb (Appendix C).

demonstrating that the boundary of the Contaminated Process Area had been adequately defined.

On 18 March 1989 18 additional soil samples, and three Building 54 samples were collected from the Contaminated Process Area. Of the 16 soil samples analyzed, 6 samples had TCDD concentrations below 1 ppb, 10 samples had TCDD concentrations ranging from 1-7 ppb, and 2 samples had TCDD concentrations in excess of 7 ppb (Appendix C).

Building 54 sample results (Appendix C) indicated a floor sweep TCDD concentration of 0.6 ng/sq. ft. and wall wipe samples with TCDD concentration of 1.3 ng/sq. ft. The results of these investigations are depicted on Givaudan Drawing A-9565 Rev. 6.

SECTION 5
INVESTIGATION SUMMARY AND CONCLUSIONS

5.1 Contaminated Non-Process Area

At the completion of the 20-21 May 1988, the 19 November 1988, and 18 March 1989 sampling programs, 439 soil samples were collected and 187 samples analyzed for TCDD contamination in the Contaminated Non-Process Area. The following conclusions have been reached regarding TCDD contamination in the Contaminated Non-Process Area at the Site (Givaudan Drawing A-9708 Revision H):

In Contaminated Non-Process Area A:

1. Based on TCDD concentrations found in soil samples, the Area A boundaries can be redefined as depicted on Givaudan Drawing A-9708, Revision H.
2. The deepest TCDD contaminated soils found were at 10 to 12 inches.

In Contaminated Non-Process Area B:

1. The extent of TCDD contamination has been adequately defined north and northeast of the tow path road.

2. The southwest extent of TCDD contamination, south of the tow path road has been adequately defined.

3. The extent of TCDD contamination in the northwest area south of the tow path road has not been adequately delineated. Samples 80-LL and 86-LL, at 0 to 2 inches and at 16 to 18 inches below grade, had TCDD concentrations at less than 1 ppb and 10 to 12 inches below grade contained TCDD concentrations slightly in excess of 1 ppb.

4. The deepest TCDD contaminated soils found were at 10 to 12 inches.

In Contaminated Non-Process Area C

1. The extent of TCDD contamination north of the tow path road has been defined and a new boundary can be established north and northeast of the Site power station (Givaudan Drawing A-9708, Revision H).

2. The extent of TCDD contamination has been adequately delineated in the southwest property corner as defined by the fence line and soil samples 55-LL, 57-LL and 69-LL.

3. Based on the results of the March 1989 sampling program, the limits of TCDD contamination adjacent to sample 52-LL have not been adequately defined.

4. The deepest contaminated soils found were at 12 to 18 inches.

5.2 Contaminated Process Area

Based on the results of the investigations described in this report, the following conclusions have been developed regarding the Contaminated Process Area:

1. The extent of TCDD contamination has been defined and is presented on Givaudan Drawing 9565 Revision 7. These boundaries were confirmed by sample LL-20, collected at the request of NJDEP during the 21-22 May 1988 sampling program.

2. Of the existing structures in the Contaminated Process Area, only Building 54 is considered to be TCDD contaminated.

3. With the exception of one sample, TCDD contamination is limited to the upper 18 inches of area soils.

SECTION 6
RECOMMENDATIONS

Based on the results of site field investigations and conclusions derived from them, ERM recommends the following specific actions be considered at the Givaudan Delawanna Avenue Site.

6.1 Contaminated Non-Process Area

ERM recommends that in Area A of the Contaminated Non-Process Area, additional sampling programs are not required and work can proceed on the development of a draft work plan to conduct a Feasibility Study (FS) as outlined in the 5 March 1987 ACO, Section III Paragraph 42.

It is recommended that a limited sampling program be conducted to establish the limits of the isolated TCDD contamination in Area B in the vicinity of soil samples 80-LL and 86-LL. A similar sampling program is recommended in the Area adjacent to sample 52-LL of the Contaminated Non-Process Area C.

6.2 Contaminated Process Area

Based on the results of the field investigations and laboratory analyses conducted during these investigations, ERM recommends that in the Contaminated Process Area, no additional sampling programs be conducted and the boundaries be redefined as in Figure 6-1 and Givaudan Drawing A-9565, Revision 7. Further, it is recommended that work begin on the development of a draft work plan to conduct a Feasibility Study (FS) as outlined in the 5 March 1987 ACO, Section III Paragraph 42.

A detailed Contaminated Non-Process Area sampling plan and draft work plan for conducting a Feasibility Study in the Contaminated Process Area will be prepared after this report has been accepted by both Givaudan and NJDEP.

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List of Attachments

Attachment 1	14 August 1989 Letter from NJDEP to Givaudan
Attachment 2	12 September 1989 Non-Process Area Sampling Plan Letter from Givaudan to NJDEP
Attachment 3	12 October 1989 Letter from NJDEP to Givaudan
Attachment 4	19 October 1989 Letter from Givaudan to NJDEP
Attachment 5	30 October 1989 Letter from NJDEP to Givaudan
Attachment 6	10 November 1989 Letter from Givaudan to NJDEP
Attachment 7	30 November 1989 Letter from NJDEP to Givaudan
Attachment 8	19 January 1990 Letter from Givaudan to NJDEP

LIST OF DRAWINGS

Givaudan Drawing A-9567 Revision G
Givaudan Drawing A-9567 Revision H
Givaudan Drawing A-9567 Revision I
Givaudan Drawing A-9567 Revision J

The ERM Group

LIMITED TCDD INVESTIGATION REPORT FOR THE GIVAUDAN CORPORATION, CLIFTON, NEW JERSEY

12 July 1990

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SECTION 1
INTRODUCTION

1.1 Introduction

At the request of the Givaudan Corporation (Givaudan), Environmental Resources Management, Inc. (ERM) conducted a limited soils investigation at the Givaudan Delawanna Avenue Plant (Site), located in Clifton, New Jersey. This limited investigation was conducted to complete the delineation of 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD) in the area identified as the "Contaminated Non-Process Area".

The information generated as a result of this limited investigation is presented in this Limited Investigation Report and augments information previously presented to the New Jersey Department of Environmental Protection (NJDEP) in the 18 May 1989 report entitled " Draft TCDD Investigation Report" (May 1989 Report). This document, in conjunction with the May 1989 Report, comprises the 2,3,7,8 TCDD Remedial Investigation of the Givaudan Site and fulfills the requirements set forth in Section II Paragraphs 38 through 41 of the 5 March 1987 Administrative Consent Order (ACO) entered into between Givaudan and the NJDEP.

1.2 Summary of Dioxin Investigation Activities

Below is a summary of those events related to dioxin investigations at the Site after submittal of the May 1989 Report. Those events which occurred prior to the limited investigations herein described are detailed in the May 1989 Report.

Written conditional approval of the May 1989 Investigation Report from NJDEP was received by Givaudan in a letter dated 14 August 1989 (Attachment 1). In this letter, NJDEP stated that the findings and recommendations presented in the May 1989 Report were conditionally approved pending the completion of an NJDEP Quality Assurance (QA) Review of the analytical data packages generated as part of the investigation. Through conditional approval of this document, the NJDEP agreed that in the area designated the "Contaminated Process Area" (page 5-3 of May 1989 Report):

1. The extent of TCDD contamination had been defined ; and
2. Of the existing structures in the Contaminated Process Area, only Building 54 is considered to be TCDD contaminated.

In addition to these findings, Givaudan recommended, and NJDEP agreed, that in the area designated the "Contaminated Non-Process Area";

1. Additional Sampling in Area A is not required;
2. A limited sampling program should be conducted to establish the limits of the isolated TCDD contamination in Area B in the vicinity of soil sample 80-LL and 86-LL; and
3. A similar limited sampling program be conducted adjacent to sample 52-LL in the Contaminated Non-Process Area C.

This Limited Remedial Investigation Report summarizes the work completed, data obtained, results, and conclusions drawn from the 1990 TCDD limited soils investigation. This work was completed in accordance with previously approved NJDEP work plans, and conforms, to the extent practicable, with the United States Environmental Protection Agency (USEPA) Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) and National Contingency Plan (NCP) guidelines.

SECTION 2
FIELD INVESTIGATIONS

As required in the 14 August 1989 letter from NJDEP to Givaudan, a limited Contaminated Non-Process Area Sampling Plan (Plan) was submitted to NJDEP for review and comment (Attachment 2). This Plan detailed the collection and analytical protocols to be used during the completion of the limited soils investigation.

After review of this Plan, NJDEP forwarded to Givaudan on 12 October 1989, comments on the sampling plan requiring specific clarification (Attachment 3). These comments were responded to by Givaudan in a letter dated 19 October 1989. (Attachment 4) and was provided to NJDEP by Givaudan as a formal Plan revision written response to the items upon which NJDEP required clarification.

On 30 October 1989, NJDEP indicated that unresolved issues remained (Attachment 5). These issues were subsequently addressed in a letter provided to NJDEP by Givaudan on 10 November 1989 (Attachment 6).

On November 30, 1989 Givaudan received approval by NJDEP to conduct the TCDD limited soil sampling investigation (Attachment 7). Due to difficult weather conditions, subcontractor availability and scheduling difficulties, the implementation of this limited soils investigation was unavoidably delayed until early Spring 1990. This delay was approved by NJDEP in phone conversations, and as required in the ACO, Givaudan notified NJDEP, in writing, the nature of the delay and the expected investigation execution date (Attachment 8).

The Plan was executed on 6 -8 April 1990, using methods, techniques and sample handling protocols previously approved by NJDEP (See May 1989 Report). The final sampling program consisted of collecting 26 surface samples, and 66 split-barrel core samples.

The split-barrel core samples were collected by Aquifer Drilling and Testing, Inc., a New-Jersey licensed well driller using methods consistent with ASTM D1586-67. Wafers from the split-barrel samples were obtained in accordance with the NJDEP-approved limited investigation sampling plan and included:

- Surface sample;
- 4 inch to 6 inch below land surface (BLS) wafer;
- 10 inch to 12 inch BLS wafer;
- 16 inch to 24 inch BLS wafer; and
- 22 to 24 inch BLS wafer.

The core wafers, 26 surface samples, and the required field duplicate soil samples and equipment rinsate samples were forwarded to Enseco California Analytical Laboratories under proper NJDEP chain-of-custody documentation for analysis. In addition to the above samples, the required Performance Evaluation (PE) samples (supplied by NJDEP), were also sent to the laboratory for analysis and inclusion in the Tier I data package.

The soil samples were sequentially analyzed using the Givaudan proposed (Attachment 2) and NJDEP (Attachment 3) approved sampling plan which required the analysis of samples obtained from locations adjacent to areas of known TCDD contamination and moving outward until both horizontal and vertical extinction were achieved (less than 1 ppb 2,3,7,8 TCDD).

SECTION 3
RESULTS AND DISCUSSION OF FIELD INVESTIGATIONS

In total, 356 soil samples were collected and forwarded to Enseco California Analytical Laboratories for analysis. The analyses for samples analyzed are included in the data reports generated by the laboratory using the NJDEP Tier I Deliverables data reporting (package) format. One copy of the NJDEP Tier I data package is being submitted to NJDEP as part of this report. Specific sampling locations are identified on enclosed Givaudan Drawing A-9567, Revision G.

Get Drawing A-9567 Rev. H for p

Drawing A-9567, Revision G also depicts the delineated TCDD limits presented in the May 1989 Report and conditionally approved by NJDEP. Additional TCDD delineation was required in three areas. Two, identified as "To be Defined" on the drawing; and a third area, south of Building 90 and north of the tow-path road.

Using the NJDEP approved analytical protocol, 42 soil samples required analyses for TCDD. The results of the analyses are presented in Table 3-1. These analyses are presented graphically in Givaudan Drawing A-9567, Revision I.

Get Drawing A-9567 Revision for Sect. 3 Ltd TCDD

In Area C, three soil samples were analyzed. No sample contained TCDD concentrations above 1 ppb. Therefore, with the three additional analyses, delineation of TCDD contamination in the soils of Area C is considered to be complete.

In Area B, 17 core locations (a total of 36 soil samples) required analysis. Soil samples were analyzed until horizontal and vertical TCDD extinction was confirmed. The results of the analyses are presented on Givaudan Drawing A-9567, Revision I. With the additional soil analyses, delineation of TCDD contamination in the soils of Area B is now considered to be complete.

SECTION 4
CONCLUSIONS

Based on previous investigations (first reported in the May 1989 Investigation Report), and the limited soils investigation conducted during 1990, the horizontal and vertical extent of 2,3,7,8 TCDD has been delineated at the Givaudan Site and is presented on Givaudan Drawing A-9567, Revision J.

The information collected in previous studies and presented in the ACO; the data collected and presented in the May 1989 Investigation Report, and the information presented in this limited investigation report indicate that additional remedial investigations at this site are not required. Sufficient information has been gathered at the Site such that an informed risk management decision can be made.

In the 14 August 1989 letter from NJDEP to Givaudan, a limited Remedial Investigation Report was required to be presented to NJDEP. The field investigations described in this report, and accompanying Givaudan Drawings satisfy this requirement. In addition, with the submission of this document, the specific requirements set forth in Section II Paragraphs 38 through 41 of the the 1987 TCDD ACO have also been met.

SECTION 5
RECOMMENDATIONS

With the additional information contained in this Limited Investigation Report, the Feasibility Study (FS), including an evaluation of environmental and public health impacts for the identified alternatives, can be completed. These documents will be submitted to NJDEP for review and comment 75 days (Paragraph 44 of the 1987 TCDD ACO) after receiving written NJDEP notification of final TCDD investigation approval.

TABLE 3.1
Limited Investigation Sample Analysis

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #
90/04/05	GIV100P	PE SAMPLE	1.1		144856	052322-0290-SA
	GIV102P	PE SAMPLE	ND	0.012	144858	052322-0292-SA
	GIV103P	PE SAMPLE	2.5		144859	052322-0293-SA
	GIV105P	PE SAMPLE	2.9		144861	052322-0295-SA
	GIV106P	PE SAMPLE	1.0		144862	052322-0296-SA
	GIV108P	PE SAMPLE	2.4		144864	052322-0298-SA
	GIV109P	PE SAMPLE	2.6		144865	052322-0299-SA
	GIV110P	PE SAMPLE	ND	0.019	144866	052322-0300-SA
90/04/06	01-LI	00-01" SURFACE SOIL	0.27		144506	052322-0001-SA
	03-LI	00-01" SURFACE SOIL	0.41		144509	052322-0003-SA
	03-LI DUPLICATE	00-01" SURFACE SOIL	0.28		144839	052322-0276-SA
	04-LI	00-01" SURFACE SOIL	0.10		144510	052322-0004-SA
90/04/07	27-LI	00-01" SURFACE SOIL	0.32		144531	052322-0025-SA
		10-12" SOIL WAFER	0.40		144532	052322-0026-SA
	28-LI	00-01" SURFACE SOIL	0.064		144533	052322-0027-SA
		10-12" SOIL WAFER	0.57		144534	052322-0028-SA
	31-LI	00-01" SURFACE SOIL	ND	0.036	144539	052322-0033-SA
		10-12" SOIL WAFER	ND	0.020	144540	042322-0034-SA
	32-LI	00-01" SURFACE SOIL	9.4		144541	052322-0035-SA
		10-12" SOIL WAFER	ND	0.007	144542	052322-0036-SA
	33-LI	00-01" SURFACE SOIL	1.3		144555	052322-0049-SA
		10-12" SOIL WAFER	ND	0.0093	144556	052322-0050-SA
	34-LI	00-01" SURFACE SOIL	0.063		144559	052322-0051-SA
		10-12" SOIL WAFER	ND	0.017	144560	052322-0052-SA
	35-LI	00-01" SURFACE SOIL	0.49		144561	052322-0053-SA
		10-12" SOIL WAFER	0.013	0.013	144562	052322-0054-SA

TABLE 3.1
Limited Investigation Sample Analysis

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #
90/04/07	35-LI DUPLICATE	10-12" SOIL WAFER	ND	0.0078	144847	052322-0281-SA
	36-LI	00-01" SURFACE SOIL	0.16		144564	052322-0055-SA
		10-12" SOIL WAFER	2.5		144565	052322-0056-SA
		16-18" SOIL WAFER	ND	0.014	144552	052322-0046-SA
	37-LI	00-01" SURFACE SOIL	0.078		144567	052322-0057-SA
		10-12" SOIL WAFER	1.2		144568	052322-0058-SA
		16-18" SOIL WAFER	ND	0.010	144553	052322-0047-SA
	38-LI	00-01" SURFACE SOIL	0.24		144569	052322-0059-SA
		10-12" SOIL WAFER	0.39		144570	052322-0060-SA
	39-LI	00-01" SURFACE SOIL	0.51		144583	052322-0073-SA
		10-12" SOIL WAFER	0.66		144584	052322-0074-SA
	40-LI	00-01" SURFACE SOIL	0.044		144585	052322-0075-SA
		10-12" SOIL WAFER	0.36		144586	052322-0076-SA
	46-LI	00-01" SURFACE SOIL	0.37		144631	052322-0099-SA
		10-12" SOIL WAFER	ND	0.0096	144632	052322-0100-SA
	HEXANE RINSATE		ND	0.059	151177	052322-0277-SA
90/04/08	79-LI	00-01" SURFACE SOIL	0.054		144787	052322-0225-SA
		10-12" SOIL WAFER	58		144788	052322-0226-SA
		16-18" SOIL WAFER	1.6		144795	052322-0233-SA
		22-24" SOIL WAFER	0.042		144774	052322-0212-SA
	79-LI DUPLICATE	10-12" SOIL WAFER	76		144848	052322-0282-SA
	80-LI	00-01" SURFACE SOIL	0.016		144789	052322-0227-SA
		10-12" SOIL WAFER	18		144790	052322-0228-SA
		16-18" SOIL WAFER	ND	0.011	144796	052322-0234-SA
	81-LI	00-01" SURFACE SOIL	0.015		144803	052322-0241-SA
		10-12" SOIL WAFER	0.049		144804	052322-0242-SA

TABLE 3.1
Limited Investigation Sample Analysis

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #
90/04/08	82-LI	00-01" SURFACE SOIL	0.11		144805	052322-0243-SA
		10-12" SOIL WAFER	ND	0.033	144806	052322-0244-SA

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With the completion of this limited soils investigation, the TCDD contaminated soil boundaries of the Contaminated Non-Process Area have been defined. These boundaries are depicted in Givaudan Drawing A 9567, Revision H.

GIVAUDAN CORPORATION
TCDD INVESTIGATION REPORT

APPENDIX C

TABULATED LABORATORY RESULTS

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/02/20	G-11	36"-1 SOIL EXCAVATION; WEST SIDE	ND	0.28	030257-001		
		36"-2 SOIL EXCAVATION; CENTER	ND	0.19	030257-002		
		36"-3 SOIL EXCAVATION; EAST SIDE	ND	0.41	030257-003		
88/05/21	LL-01	00-02" SURFACE SOIL	0.33		41694-01		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.17	41694-02		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.22	41694-03		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-02	00-02" SURFACE SOIL	0.26		41694-04		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.10	41694-05		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	0.15		41694-06		
		28-30" SOIL WAFER					
	LL-03	00-02" SURFACE SOIL	ND	0.11	41694-07		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	0.23		41694-08		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.03	41694-09		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-04	00-02" SURFACE SOIL	0.47		41694-10		

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

'L. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/05/21	LL-04	04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.04	41694-11		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.04	41694-12		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-05	00-02" SURFACE SOIL	0.46		41694-13		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	3.8		41694-14		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.02	41694-15		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-06	00-02" SURFACE SOIL	0.55		41694-16		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	11.3		41694-17		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.07	41694-18		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-07	00-02" SURFACE SOIL	0.22		41694-19		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	0.14		41694-20		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.05	41694-21		
		28-30" SOIL WAFER					

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

.L. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/05/21	LL-07	34-36" SOIL WAFER					
	LL-08	00-02" SURFACE SOIL	1.3		41694-22		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	15.4		41694-23		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.03	41694-24		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-09	00-02" SURFACE SOIL	0.88		41694-25		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.08	41694-26		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.05	41694-28		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-10	00-02" SURFACE SOIL	0.27		41694-29		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	4.8		41694-30		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.06	41694-31		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-11	00-02" SURFACE SOIL	0.17		41694-32		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	5.5		41694-33		
		16-18" SOIL WAFER					

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/05/21	LL-11	22-24" SOIL WAFER	ND	0.12	41694-34		
		28-30" SOIL WAFER					
	LL-12	00-02" SURFACE SOIL	0.12		41694-35		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	4.4		41694-36		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.02	41694-37		
		28-30" SOIL WAFER					
	LL-13	00-02" SURFACE SOIL	0.85		41694-46		
		06-09" SOIL WAFER	1.6		41694-47		
	LL-14	00-02" SURFACE SOIL	0.52		41694-44		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	3.55		41694-45		
	LL-15	00-02" SURFACE SOIL	4.8		41694-38		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.03	41694-39		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.05	41694-40		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-HEX. RIN.	HEXANE RINSE					
	LL-HEX. RIN.2	HEXANE RINSE					
88/05/22	LL-16	00-02" SURFACE SOIL	1.9		41694-49		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	9.4		41694-50		
		16-18" SOIL WAFER					

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/05/22	LL-16	22-24" SOIL WAFER	ND	0.02	41694-51		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-17	00-02" SURFACE SOIL	0.12		41694-52		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.03	41694-53		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.02	41694-54		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-18	00-02" SURFACE SOIL	ND	0.09	41694-55		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.03	41694-56		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.03	41694-57		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-19	00-02" SURFACE SOIL	0.50		41694-58		
		04-06" SOIL WAFER					
		10-12" SOIL WAFER	ND	0.02	41694-59		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.07	41694-60		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
	LL-19 HR	HEXANE RINSE (LL-19)	ND	0.09	41694-66		
	LL-20	00-02" SURFACE SOIL	0.39		41694-41		

SMPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/05/22	LL-20	04-06" SOIL WAFER					
		10-12" SOIL WAFER	0.18		41694-42		
		16-18" SOIL WAFER					
		22-24" SOIL WAFER	ND	0.08	41694-43		
		28-30" SOIL WAFER					
		34-36" SOIL WAFER					
88/11/19	01-LL	04-06" SOIL WAFER			044634-0001-SA		
		10-12" SOIL WAFER	0.86		044532-0002-SA		
		16-18" SOIL WAFER			044532-0003-SA		
		22-24" SOIL WAFER			044634-0002-SA		
	02-LL	00-02" SURFACE SOIL	0.52		044634-0035-SA		
		04-06" SOIL WAFER			044634-0029-SA		
		10-12" SOIL WAFER	2.8		044634-0036-SA		
		16-18" SOIL WAFER	ND	0.10	044634-0037-SA	045303-0002-SA	
		22-24" SOIL WAFER			044634-0030-SA		
	03-LL	00-02" SURFACE SOIL			044634-0038-SA		
		04-06" SOIL WAFER			044634-0031-SA		
		10-12" SOIL WAFER			044634-0039-SA		
		16-18" SOIL WAFER			044634-0040-SA		
		22-24" SOIL WAFER			044634-0032-SA		
	04-LL	00-02" SURFACE SOIL			044634-0041-SA		
		04-06" SOIL WAFER			044634-0050-SA		
		10-12" SOIL WAFER			044634-0042-SA		
		16-18" SOIL WAFER			044634-0043-SA		
		22-24" SOIL WAFER			044634-0051-SA		
	05-LL	00-02" SURFACE SOIL	N/D	0.062	044532-0004-SA		

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	05-LL	04-06" SOIL WAFER			044634-0003-SA		
		10-12" SOIL WAFER	12		044532-0005-SA		
		16-18" SOIL WAFER	0.24		044532-0006-SA	045208-0001-SA	
		22-24" SOIL WAFER			044634-0004-SA		
	06-LL	00-02" SURFACE SOIL	ND	0.21	044634-0044-SA		
		04-06" SOIL WAFER			044634-0052-SA		
		10-12" SOIL WAFER	ND	0.20	044634-0045-SA		
		16-18" SOIL WAFER			044634-0046-SA		
		22-24" SOIL WAFER			044634-0053-SA		
	07-LL	00-02" SURFACE SOIL	ND	0.10	044634-0047-SA	045303-0014-SA	
		04-06" SOIL WAFER			044634-0054-SA		
		10-12" SOIL WAFER	ND	0.018	044634-0048-SA	045303-0015-SA	
		16-18" SOIL WAFER			044634-0049-SA		
		22-24" SOIL WAFER			044634-0055-SA		
	08-LL	00-02" SURFACE SOIL	0.60		044532-0007-SA		
		04-06" SOIL WAFER			044634-0005-SA		
		10-12" SOIL WAFER	ND	0.031	044532-0008-SA		
		16-18" SOIL WAFER			044532-0009-SA		
		22-24" SOIL WAFER			044634-0006-SA		
	09-LL	00-02" SURFACE SOIL	0.065		044532-0010-SA		
		04-06" SOIL WAFER			044634-0007-SA		
		10-12" SOIL WAFER	ND	0.016	044532-0011-SA		
		16-18" SOIL WAFER			044532-0012-SA		
		22-24" SOIL WAFER			044634-0008-SA		
	10-LL	00-02" SURFACE SOIL	ND	0.13	044634-0060-SA		
		04-06" SOIL WAFER			044634-0056-SA		

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	10-LL	10-12" SOIL WAFER	3.3		044634-0061-SA		
		16-18" SOIL WAFER	ND	0.18	044634-0062-SA	045303-0003-SA	
		22-24" SOIL WAFER			044634-0057-SA		
	11-LL	00-02" SURFACE SOIL	ND	0.18	044634-0063-SA	045303-0004-SA	
		04-06" SOIL WAFER			044634-0058-SA		
		10-12" SOIL WAFER	ND	0.17	044634-0064-SA	045303-0005-SA	
		16-18" SOIL WAFER			044634-0065-SA		
		22-24" SOIL WAFER			044634-0059-SA		
	12-LL	00-02" SURFACE SOIL	ND	0.030	044634-0066-SA	045303-0006-SA	
		04-06" SOIL WAFER			044634-0071-SA		
		10-12" SOIL WAFER	ND	0.017	044634-0067-SA	045303-0007-SA	
		16-18" SOIL WAFER			044634-0068-SA		
		22-24" SOIL WAFER			044634-0072-SA		
	13-LL	00-02" SURFACE SOIL	0.13		044532-0013-SA		
		04-06" SOIL WAFER			044634-0011-SA		
		10-12" SOIL WAFER	ND	0.020	044532-0014-SA		
		16-18" SOIL WAFER			044532-0015-SA		
		22-24" SOIL WAFER			044634-0012-SA		
	14-LL	00-02" SURFACE SOIL	0.60		044634-0069-SA		
		04-06" SOIL WAFER			044634-0073-SA		
		10-12" SOIL WAFER	ND	0.067	044634-0070-SA		
		16-18" SOIL WAFER			044634-0082-SA		
		22-24" SOIL WAFER			044634-0074-SA		
	15-LL	00-02" SURFACE SOIL	11		044634-0088-SA		
		04-06" SOIL WAFER			044634-0075-SA		
		10-12" SOIL WAFER	ND	0.061	044634-0089-SA		

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SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	15-LL	16-18" SOIL WAFER			044634-0090-SA		
		22-24" SOIL WAFER			044634-0076-SA		
	16-LL	00-02" SURFACE SOIL	0.56		044634-0091-SA	045303-0008-SA	
		04-06" SOIL WAFER			044634-0077-SA		
		10-12" SOIL WAFER	1.4		044634-0092-SA	045303-0009-SA	
		16-18" SOIL WAFER	ND	0.21	044634-0093-SA	045496-0001-SA	
		22-24" SOIL WAFER			044634-0078-SA		
	17-LL	00-02" SURFACE SOIL	1.4		044634-0094-SA	045496-0002-SA	
		04-06" SOIL WAFER			044634-0079-SA		
		10-12" SOIL WAFER	ND	0.070	044634-0095-SA	045496-0003-SA	
		16-18" SOIL WAFER			044634-0096-SA		
		22-24" SOIL WAFER			044634-0080-SA		
	18-LL	00-02" SURFACE SOIL	0.16		044532-0016-SA		
		04-06" SOIL WAFER			044634-0013-SA		
		10-12" SOIL WAFER	ND	0.026	044532-0017-SA		
		16-18" SOIL WAFER			044532-0018-SA		
		22-24" SOIL WAFER			044634-0014-SA		
	19-LL	00-02" SURFACE SOIL	1.8		044634-0097-SA		
		04-06" SOIL WAFER			044634-0081-SA		
		10-12" SOIL WAFER	0.086		044634-0098-SA		
		16-18" SOIL WAFER			044634-0099-SA		
		22-24" SOIL WAFER			044634-0104-SA		
	20-LL	00-02" SURFACE SOIL	ND	0.16	044634-0100-SA	045303-0010-SA	
		04-06" SOIL WAFER			044634-0105-SA		
		10-12" SOIL WAFER	ND	0.019	044634-0101-SA	045303-0011-SA	
		16-18" SOIL WAFER			044634-0102-SA		

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	20-LL	22-24" SOIL WAFER			044634-0106-SA		
	21-LL	00-02" SURFACE SOIL	0.28		044532-0019-SA		
		04-06" SOIL WAFER			044634-0015-SA		
		10-12" SOIL WAFER	ND	0.022	044532-0020-SA		
		16-18" SOIL WAFER			044532-0021-SA		
		22-24" SOIL WAFER			044634-0016-SA		
	22-LL	00-02" SURFACE SOIL	1.5		044634-0103-SA	045496-0004-SA	
		04-06" SOIL WAFER			044634-0107-SA		
		10-12" SOIL WAFER	ND	0.085	044634-0115-SA	045496-0005-SA	
		16-18" SOIL WAFER			044634-0116-SA		
		22-24" SOIL WAFER			044634-0108-SA		
	23-LL	0-02" SURFACE SOIL			044634-0117-SA		
		04-06" SOIL WAFER			044634-0109-SA		
		10-12" SOIL WAFER			044634-0118-SA		
		16-18" SOIL WAFER			044634-0119-SA		
		22-24" SOIL WAFER			044634-0110-SA		
	24-LL	00-02" SURFACE SOIL			044634-0120-SA		
		04-06" SOIL WAFER			044634-0111-SA		
		10-12" SOIL WAFER			044634-0121-SA		
		16-18" SOIL WAFER			044634-0122-SA		
		22-24" SOIL WAFER			044634-0112-SA		
	25-LL	00-02" SURFACE SOIL	4.6		044634-0022-SA		
		04-06" SOIL WAFER			044634-0017-SA		
		10-12" SOIL WAFER	ND	0.019	044532-0023-SA		
		16-18" SOIL WAFER			044532-0024-SA		
		22-24" SOIL WAFER			044634-0018-SA		

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	26-LL	00-02" SURFACE SOIL	0.95		044634-0123-SA		
		04-06" SOIL WAFER			044634-0113-SA		
		10-12" SOIL WAFER	ND	0.049	044634-0124-SA		
		16-18" SOIL WAFER			044634-0125-SA		
		22-24" SOIL WAFER			044634-0114-SA		
	27-LL	00-02" SURFACE SOIL			044634-0126-SA		
		04-06" SOIL WAFER			044634-0137-SA		
		10-12" SOIL WAFER			044634-0127-SA		
		16-18" SOIL WAFER			044634-0128-SA		
		22-24" SOIL WAFER			044634-0138-SA		
	28-LL	00-02" SURFACE SOIL			044634-0129-SA		
		04-06" SOIL WAFER			044634-0139-SA		
		10-12" SOIL WAFER			044634-0130-SA		
		16-18" SOIL WAFER			044634-0131-SA		
		22-24" SOIL WAFER			044634-0140-SA		
	29-LL	00-02" SURFACE SOIL			044634-0132-SA		
		04-06" SOIL WAFER			044634-0141-SA		
		10-12" SOIL WAFER			044634-0133-SA		
		16-18" SOIL WAFER			044634-0134-SA		
		22-24" SOIL WAFER			044634-0142-SA		
	30-LL	00-02" SURFACE SOIL	19		044532-0025-SA		
		00-02" SURFACE SOIL REPEAT	2.4		044532-0025-SA	045303-0018-SA	
		04-06" SOIL WAFER			044634-0019-SA		
		10-12" SOIL WAFER	ND	0.22	044532-0026-SA		
		16-18" SOIL WAFER			044532-0027-SA		

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SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	30-LL	22-24" SOIL WAFER			044634-0020-SA		
	31-LL	00-02" SURFACE SOIL			044634-0135-SA		
		04-06" SOIL WAFER			044634-0143-SA		
		10-12" SOIL WAFER			044634-0136-SA		
		16-18" SOIL WAFER			044634-0147-SA		
		22-24" SOIL WAFER			044634-0144-SA		
	32-LL	00-02" SURFACE SOIL	0.17		044634-0148-SA		
		04-06" SOIL WAFER			044634-0145-SA		
		10-12" SOIL WAFER	0.89		044634-0149-SA		
	33-LL	00-02" SURFACE SOIL	0.22		044634-0033-SA	045303-0016-SA	
		04-06" SOIL WAFER			044634-0026-SA		
		10-12" SOIL WAFER	5.8		044634-0034-SA	045303-0017-SA	
		16-18" SOIL WAFER			044634-0186-SA		
		22-24" SOIL WAFER			044634-0187-SA		
	34-LL	00-02" SURFACE SOIL	0.22		044532-0028-SA		
		04-06" SOIL WAFER			044634-0024-SA		
		10-12" SOIL WAFER	ND	0.014	044532-0029-SA		
		16-18" SOIL WAFER			044532-0030-SA		
		22-24" SOIL WAFER			044634-0025-SA		
	35-LL	00-02" SURFACE SOIL	11		044532-0031-SA		
		04-06" SOIL WAFER			044634-0027-SA		
		10-12" SOIL WAFER	ND	0.25	044532-0032-SA		
		16-18" SOIL WAFER			044532-0033-SA		
		22-24" SOIL WAFER			044634-0028-SA		
	36-LL	00-02" SURFACE SOIL	4.6		044634-0150-SA		
		04-06" SOIL WAFER			044634-0146-SA		

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
0_/11/19	36-LL	10-12" SOIL WAFER	ND	0.052	044634-0151-SA		
		16-18" SOIL WAFER			044634-0152-SA		
		22-24" SOIL WAFER					
	37-LL	00-02" SURFACE SOIL	0.54		044634-0153-SA		
		04-06" SOIL WAFER			044634-0159-SA		
		10-12" SOIL WAFER	ND	0.017	044634-0154-SA		
	38-LL	00-02" SURFACE SOIL	6.6		044634-0155-SA	045303-0012-SA	
		04-06" SOIL WAFER			044634-0160-SA		
		10-12" SOIL WAFER	1.5		044634-0156-SA	045303-0013-SA	
		16-18" SOIL WAFER	ND	0.062	044634-0157-SA	045496-0006-SA	
	39-LL	00-02" SURFACE SOIL	1.9		044634-0169-SA		
		04-06" SOIL WAFER			044634-0162-SA		
		10-12" SOIL WAFER	0.39		044634-0170-SA		
		16-18" SOIL WAFER			044634-0171-SA		
		22-24" SOIL WAFER			044634-0163-SA		
	40-LL	00-02" SURFACE SOIL	1.3		044532-0037-SA		
		04-06" SOIL WAFER			044634-0164-SA		
		10-12" SOIL WAFER	ND	0.025	044532-0038-SA		
		16-18" SOIL WAFER			044532-0039-SA		
		22-24" SOIL WAFER			044634-0165-SA		
	41-LL	00-02" SURFACE SOIL	2.6		044532-0040-SA		
		04-06" SOIL WAFER			044634-0166-SA		
		10-12" SOIL WAFER	ND	0.037	044532-0041-SA		
		16-18" SOIL WAFER			004532-0042-SA		
		22-24" SOIL WAFER			044634-0167-SA		
	42-LL	00-02" SURFACE SOIL	ND	0.53	044634-0021-SA		

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
88/11/19	42-LL	04-06" SOIL WAFER			044634-0009-SA		
		10-12" SOIL WAFER	ND	0.040	044634-0022-SA		
		16-18" SOIL WAFER			044634-0023-SA		
	42-LL..	22-24" SOIL WAFER			044634-0010-SA		
	43-LL	00-02" SURFACE SOIL	0.39		044532-0034-SA		
		04-06" SOIL WAFER			044634-0168-SA		
		10-12" SOIL WAFER	ND	0.037	044532-0035-SA		
		16-18" SOIL WAFER			044532-0036-SA		
		22-24" SOIL WAFER			044634-0172-SA		
	45-LL	00-02" SURFACE SOIL	1.6		044634-0086-SA		
	46-LL	00-02" SURFACE SOIL	1.9		044634-0085-SA		
	47-LL	00-02" SURFACE SOIL	2.7		044634-0087-SA		
	HEXANE RINSATE	HEXANE RINSE OF SPOON	ND	0.0026	044634-0084-SA	045877-0001-SA	
89/03/18	50-LL	00-02" SURFACE SOIL			046303-0001-SA		
	51-LL	00-02" SURFACE SOIL			046303-0002-SA		
	52-LL	00-02" SURFACE SOIL	1.7		046303-0003-SA		
	53-LL	00-02" SURFACE SOIL			046303-0004-SA		
	54-LL	00-02" SURFACE SOIL	6.2		046303-0005-SA	046709-0017-SA	
	55-LL	00-02" SURFACE SOIL	0.81		046303-0006-SA		
	56-LL	00-02" SURFACE SOIL	7.0		046303-0007-SA	046709-0018-SA	
	57-LL	00-02" SURFACE SOIL	0.32		046303-0008-SA		
	58-LL	00-02" SURFACE SOIL			046303-0009-SA		
	59-LL	00-02" SURFACE SOIL	1.4		046303-0010-SA	046709-0019-SA	
	60-LL	00-02" SURFACE SOIL			046303-0011-SA		
	61-LL	00-02" SURFACE SOIL			046303-0012-SA		

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
89/03/18	62-LL	00-02" SURFACE SOIL			046303-0013-SA		
	63-LL	00-02" SURFACE SOIL	0.10		046303-0014-SA	046709-0020-SA	
	64-LL	00-02" SURFACE SOIL	1.2		046301-0001-SA		
	65-LL	00-02" SURFACE SOIL	1.3		046303-0015-SA	046709-0021-SA	
	66-LL	00-02" SURFACE SOIL	1.3		046303-0016-SA		
	67-LL	00-02" SURFACE SOIL	3.9		046303-0017-SA	046709-0022-SA	
	68-LL	00-02" SURFACE SOIL	0.94		046303-0018-SA		
	69-LL	00-02" SURFACE SOIL	0.76		046303-0019-SA		
	70-LL	00-02" SURFACE SOIL	ND	0.10	046301-0002-SA		
	71-LL	00-02" SURFACE SOIL	ND	0.078	046301-0003-SA		
	72-LL	00-02" SURFACE SOIL	ND	0.038	046301-0004-SA		
	73-LL	00-02" SURFACE SOIL	ND	0.043	046301-0005-SA		
	74-LL	00-02" SURFACE SOIL			046303-0020-SA		
	75-LL	00-02" SURFACE SOIL	ND	0.13	046303-0021-SA		
	76-LL	00-02" SURFACE SOIL	0.076		046303-0022-SA	046709-0023-SA	
		04-06" SOIL WAFER			046303-0023-SA		
		10-12" SOIL WAFER	6.8		046303-0025-SA	046709-0024-SA	
		16-18" SOIL WAFER	ND	0.03	046303-0025-SA	046868-0001-SA	
		22-24" SOIL WAFER			046303-0026-SA		
	77-LL	00-02" SURFACE SOIL			046303-0027-SA		
		04-06" SOIL WAFER			046303-0028-SA		
		10-12" SOIL WAFER			046303-0029-SA		
		16-18" SOIL WAFER			046303-0030-SA		
		22-24" SOIL WAFER			046303-0031-SA		
	78-LL	00-02" SURFACE SOIL			046303-0032-SA		
		04-06" SOIL WAFER			046303-0033-SA		

932790070

SAMPLE ANALYSIS
5 MARCH 1987 TO 18 MAY 1989

SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
89/03/18	78-LL	10-12" SOIL WAFER			046303-0034-SA		
		16-18" SOIL WAFER			046303-0035-SA		
		22-24" SOIL WAFER			046303-0036-SA		
	79-LL	00-02" SURFACE SOIL	0.06		046303-0037-SA		
		04-06" SOIL WAFER	0.063		046303-0038-SA	046868-0002-SA	
		10-12" SOIL WAFER	0.035		046303-0039-SA	046868-0003-SA	
		16-18" SOIL WAFER	0.091		046303-0040-SA	046868-0004-SA	
		22-24" SOIL WAFER			046303-0041-SA		
	80-LL	00-02" SURFACE SOIL	ND	0.21	046303-0042-SA		
		04-06" SOIL WAFER			046303-0043-SA		
		10-12" SOIL WAFER	1.5		046303-0044-SA	046868-0005-SA	
		10-12" SOIL WAFER	1.6		046303-0044-SA		
		16-18" SOIL WAFER	0.22		046303-0045-SA	046709-0025-SA	
		22-24" SOIL WAFER			046303-0046-SA		
	81-LL	00-02" SURFACE SOIL			046303-0047-SA		
		04-06" SOIL WAFER			046303-0048-SA		
		10-12" SOIL WAFER			046303-0049-SA		
		16-18" SOIL WAFER			046303-0050-SA		
		22-24" SOIL WAFER			046303-0051-SA		
	82-LL	00-02" SURFACE SOIL			046303-0052-SA		
		04-06" SOIL WAFER			046303-0053-SA		
		10-12" SOIL WAFER			046303-0054-SA		
		16-18" SOIL WAFER			046303-0055-SA		
		22-24" SOIL WAFER			046303-0056-SA		
	83-LL	00-02" SURFACE SOIL	0.21		046303-0057-SA	046709-0026-SA	
		04-06" SOIL WAFER			046303-0058-SA		

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SPL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
89/03/18	83-LL	10-12" SOIL WAFER	ND	0.021	046303-0059-SA	046709-0027-SA	
		16-18" SOIL WAFER			046303-0060-SA		
		22-24" SOIL WAFER			046303-0061-SA		
	84-LL	00-02" SURFACE SOIL	ND	0.080	046303-0062-SA		
		04-06" SOIL WAFER			046303-0063-SA		
		10-12" SOIL WAFER	ND	0.14	046303-0064-SA		
		16-18" SOIL WAFER			046303-0065-SA		
		22-24" SOIL WAFER			046303-0066-SA		
	85-LL	00-02" SURFACE SOIL	0.20		046303-0067-SA	046709-0028-SA	
		04-06" SOIL WAFER			046303-0068-SA		
		10-12" SOIL WAFER	ND	0.015	046303-0069-SA	046709-0029-SA	
		16-18" SOIL WAFER			046303-0070-SA		
		22-24" SOIL WAFER			046303-0071-SA		
	86-LL	00-02" SURFACE SOIL	ND	0.12	046303-0072-SA		
		04-06" SOIL WAFER			046303-0074-SA		
		10-12" SOIL WAFER	1.3		046303-0075-SA		
		16-18" SOIL WAFER	ND	0.0054	046303-0076-SA	046709-0030-SA	
		22-24" SOIL WAFER			046303-0077-SA		
	87-LL	00-02" SURFACE SOIL	0.46		046301-0006-SA		
	88-LL	00-02" SURFACE SOIL	0.046		046303-0007-SA		
	HEXANE RINSATE	HEXANE RINSE FROM SPOON	ND	0.0040	046301-0035-SA		
	PA-01	00-06" SOIL	200		046301-0008-SA	046709-0001-SA	
	PA-02 COMPOSITE	00-06" SOIL COMPOSITE A & B	3.3		046301-0009-SA		
	PA-02-A	00-06" SOIL	4.0		046301-0020-SA	046709-0002-SA	
	PA-02-B	00-06" SOIL	0.74		046301-0021-SA	046709-0003-SA	

PL. DATE	GIV ID.	TYPE/ORIGIN	TCDD (PPB)	DL (PPB)	CAL I.D.#	LAB I.D. #	TCDD (NG/SQ FT)
89/03/18	PA-03 COMPOSITE	00-06" SOIL COMPOSITE A & B	1.3		046301-0010-SA		
	PA-03-A	00-06" SOIL	1.4		046301-0022-SA	046709-0004-SA	
	PA-03-B	00-06" SOIL	1.4		046301-0023-SA	046709-0005-SA	
	PA-04 COMPOSITE	00-06" SOIL COMPOSITE A,B, & C	0.32		046301-0011-SA		
	PA-04-A	00-06" SOIL			046301-0024-SA	046709-0006-SA	
	PA-04-B	00-06" SOIL			046301-0025-SA	046709-0007-SA	
	PA-04-C	00-06" SOIL			046301-0026-SA	046709-0008-SA	
	PA-05	00-06" SOIL COMPOSITE	4.2		046301-0012-SA		
	PA-06 COMPOSITE	00-06" SOIL COMPOSITE A & B	2.8		046301-0015-SA		
	PA-06-A	00-06" SOIL	1.9		046301-0027-SA	046709-0009-SA	
	PA-06-B	00-06" SOIL	3.6		046301-0028-SA	046709-0010-SA	
	PA-07	00-06" SOIL COMPOSITE	2.6		046301-0016-SA		
	PA-08 COMPOSITE	00-06" SOIL COMPOSITE A,B,C, & D	8.4		046301-0013-SA		
	PA-08-A	00-06" SOIL	2.7		046301-0029-SA	046709-0011-SA	
	PA-08-B	00-06" SOIL	5.3		046301-0030-SA	046709-0012-SA	
	PA-08-C	00-06" SOIL	0.45		046301-0031-SA	046709-0013-SA	
	PA-08-D	00-06" SOIL	16		046301-0032-SA	046709-0014-SA	
	PA-09 COMPOSITE	00-06" SOIL COMPOSITE A & B	1.1		046301-0014-SA		
	PA-09-A	00-06" SOIL	0.20		046301-0033-SA	046709-0015-SA	
	PA-09-B	00-06" SOIL	1.4		046301-0034-SA	046709-0016-SA	
	SWEEP; BLDG. 54	SWEEPINGS FROM 40 SQ. FT.			046301-0018-SA		0.6
	WIPE; BLDG. 54	2 WIPES N & S WALLS; 9.25 SQ. FT.			046301-0017-SA		1.3

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SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
88/02/20	G-11	*NORTH CORNER OF BLDG. 68
88/05/21	LL-01	*48 FT NE OF T.P. ROAD; 52 FT SE OF BLDG 90 RD:
	LL-02	*50 FT NE OF T.P. ROAD; 100 FT SE OF BLDG 90 RD:
	LL-03	*12 FT NE OF T.P. ROAD; 100 FT SE OF BLDG 90 RD:
	LL-04	*6 FT SW OF T.P. ROAD; 70 FT NE OF BLDG 90 RD; (EXTENDED NE SIDE OF RD):
	LL-05	*5 FT NE OF T.P. ROAD; 43 FT SW OF BLDG 90 RD; (EXTENDED NE SIDE OF RD):
	LL-06	*5 FT SW OF T.P. ROAD; (BLDG 90 RD SW EXTENDED):
	LL-07	*23 FT NE OF T.P. ROAD; 3 FT NW OF BLDG 90 RD:
	LL-08	*5 FT SE OF T.P. ROAD; 275 FT SE OF BLDG 90 RD; (NE SIDE EXTENDED):
	LL-09	*5 FT NE OF T.P. ROAD; 257 FT SE BLDG 90 RD:
	LL-10	*36 FT NE OF T.P. ROAD; 280 FT SE OF BLDG 90 RD:
	LL-11	*35 FT SE OF POWER PLANT FENCE; 262 FT SW OF BLDG 90 RD:
	LL-12	*13 FT SE OF POWER PLANT FENCE; 20 FT NW OF SE SIDE OF POWER PLANT FENCE LINE (EXTENDED):
	LL-13	*4 FT SE OF NW/SE CORNER OF POWER PLANT FENCE:
	LL-14	*4 FT NE OF POWER PLANT FENCE; 18 FT NW OF SE POWER PLANT FENCE LINE (EXTENDED):
	LL-15	*"AREA A" (SE OF POND); 14 FT NW OF ROAD: 14 FT NE OF ROAD:
88/05/22	LL-16	*SW OF POND; 30 FT SW OF ROAD; 26 FT NE OF ROAD:
	LL-17	*SW OF POND; 7 FT SE OF ROAD; 24 FT NE OF RD EXT; (EXTENSION IS ABOUT IN LINE WITH SW END OF POND):
	LL-18	*E OF POND; 23 FT SW OF ROAD; 47 FT NW OF ROAD:
	LL-19	*E OF POND; 8 FT SW OF ROAD: 21 FT NW OF RD:
	LL-20	*SW CORNER OF BLDG 42, APPROX 6 FT NE OF 40/50 ROW ROAD:

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SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
[illegible]-11/19	01-LL	*8´ NORTH OF TOW PATH ROAD; 7´EAST OF PERPENDICULAR ROAD
	02-LL	*6´ SOUTH OF TOW PATH ROAD; 10´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	03-LL	*6´ SOUTH OF TOW PATH ROAD; 20´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	04-LL	*6´ SOUTH OF TOW PATH ROAD; 30´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	05-LL	*6´ SOUTH OF TOW PATH ROAD; 50´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	06-LL	*20´ SOUTH OF TOW PATH ROAD; 10´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	07-LL	*30´ SOUTH OF TOW PATH ROAD; 26´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	08-LL	*30´ SOUTH OF TOW PATH ROAD; 43´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	09-LL	*50´ SOUTH OF TOW PATH ROAD; 30´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	10-LL	*16´ SOUTH OF TOW PATH ROAD ALONG AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	11-LL	*26´ SOUTH OF TOW PATH ROAD ALONG AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	12-LL	*36´ SOUTH OF TOW PATH ROAD ALONG AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	13-LL	*55´ SOUTH OF TOW PATH ROAD; 4 FT. WEST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD

SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
88/11/19	14-LL	*18´ SOUTH OF TOW PATH ROAD; 13´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	15-LL	*17´ SOUTH OF TOW PATH ROAD; 44´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	16-LL	*25´ SOUTH OF TOW PATH ROAD; 45´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	17-LL	*35´ SOUTH OF TOW PATH ROAD; 46´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	18-LL	*55´ SOUTH OF TOW PATH ROAD; 50´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	19-LL	*22´ SOUTH OF TOW PATH ROAD; 58´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	20-LL	*28´ SOUTH OF TOW PATH ROAD; 66´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	21-LL	*47´ SOUTH OF TOW PATH ROAD; 75´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	22-LL	*35´ SOUTH OF TOW PATH ROAD; 17´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	23-LL	*22´ SOUTH OF TOW PATH ROAD; 60 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	24-LL	*30´ SOUTH OF TOW PATH ROAD; 66 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	25-LL	*35´ SOUTH OF TOW PATH ROAD; 70 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	26-LL	*15´ SOUTH OF TOW PATH ROAD; 46 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	27-LL	*26´ SOUTH OF TOW PATH ROAD; 45 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.

SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
88/11/19	28-LL	*35´ SOUTH OF TOW PATH ROAD; 44 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	29-LL	*45´ SOUTH OF TOW PATH ROAD; 45 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	30-LL	*55´ SOUTH OF TOW PATH ROAD; 45 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	31-LL	*10´ SOUTH OF TOW PATH ROAD; 34 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	32-LL	*13´ SOUTH OF TOW PATH ROAD; 26 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	33-LL	*16´ SOUTH OF TOW PATH ROAD; 18 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	34-LL	*20´ SOUTH OF TOW PATH ROAD; 10 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	35-LL	*10´ SOUTH OF TOW PATH ROAD; 66 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	36-LL	*7´ SOUTH OF TOW PATH ROAD; 57 FT. WEST OF THE SOUTH EAST PROPERTY LINE FENCE.
	37-LL	*7´ N/E OF THE EAST CORNER OF POWER STATION FENCE; 60´N/W OF THE WEST CORNER ALONG FENCE LINE
	38-LL	*7´ N/E OF THE EAST CORNER OF POWER STATION FENCE; 45´N/W OF THE WEST CORNER ALONG FENCE LINE
	39-LL	*7´ N/E OF THE EAST CORNER OF POWER STATION FENCE
	40-LL	*REF POND: 44´ WEST OF ROAD SOUTH OF POND: 1[illegible]´ N/E OF ROAD SOUTH WEST OF POND
	41-LL	*REF POND: 13´ WEST OF ROAD SOUTH OF POND: 23´ N/E OF ROAD SOUTH WEST OF POND
	42-LL	*REF: ROAD EXTENSION NORTH OF BLDG. 90; 35´ N/W OF END OF ROAD, 63´ SW OF ROAD
	43-LL	*55´ SOUTH OF TOW PATH ROAD; 12´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	45-LL	*4´ S/E OF THE EAST CORNER OF POWER STATION FENCE
	46-LL	*6´ S/E OF POWER STATION FENCE; 17´ S/W ALONG FENCE

SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
88/11/19	46-LL	LINE
89/03/18	47-LL	*6´ S/E OF POWER STATION FENCE; 30´ S/W ALONG FENCE LINE
	50-LL	*5´ SOUTH OF TOW PATH ROAD; 40´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	51-LL	*5´ SOUTH OF TOW PATH ROAD; 30´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	52-LL	*5´ SOUTH OF TOW PATH ROAD; 20´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	53-LL	*30´ SOUTH OF TOW PATH ROAD; 30´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	54-LL	*30´ SOUTH OF TOW PATH ROAD; 20´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	55-LL	*30´ SOUTH OF TOW PATH ROAD; 10´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	57-LL	*55´ SOUTH OF TOW PATH ROAD; 10´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	58-LL	*55´ SOUTH OF TOW PATH ROAD; 42´EAST OF AN IMAGINARY LINE EXTENDED S/W OF THE SOUTH WALL OF BLDG. 99
	59-LL	*75´ SOUTH OF TOW PATH ROAD; 45´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	60-LL	*50´ SOUTH OF TOW PATH ROAD; 60´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	61-LL	*65´ SOUTH OF TOW PATH ROAD; 75´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	62-LL	*75´ SOUTH OF TOW PATH ROAD; 75´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	63-LL	*75´ SOUTH OF TOW PATH ROAD; 85´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF

SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
89/03/18	63-LL	BLDG. 99
	64-LL	*75´ SOUTH OF TOW PATH ROAD; 105´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	65-LL	*80´ SOUTH OF TOW PATH ROAD; 90´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	66-LL	*80´ SOUTH OF TOW PATH ROAD; 105´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	67-LL	*55´ SOUTH OF TOW PATH ROAD; 90´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	68-LL	*55´ SOUTH OF TOW PATH ROAD; 105´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	69-LL	*100´ SOUTH OF TOW PATH ROAD; 48´ EAST OF AN IMAGINARY LINE EXTENDED ALONG THE SOUTHERN WALL OF BLDG. 99
	70-LL	*15´ S/E OF POWER STATION FENCE; 18´ S/W ALONG FENCE LINE
	71-LL	*15´ S/E OF THE EAST CORNER OF POWER STATION FENCE
	72-LL	*15´ N/E OF THE EAST CORNER OF POWER STATION FENCE
	73-LL	*15´ N/E OF THE EAST CORNER OF POWER STATION FENCE; 45´N/W OF THE WEST CORNER ALONG FENCE LINE
	74-LL	*15´ S/E OF POWER STATION FENCE; 33´ S/W ALONG FENCE LINE
	75-LL	*35´ SOUTH OF TOW PATH ROAD; 80´ EAST OF AN IMAGINARY LINE FROM THE EAST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	76-LL	*1´ SOUTH OF TOW PATH ROAD; 50´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	77-LL	*5´ SOUTH OF TOW PATH ROAD; 60´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD

SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
89/03/18	78-LL	*5´ SOUTH OF TOW PATH ROAD; 80´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	79-LL	*5´ SOUTH OF TOW PATH ROAD; 100´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	80-LL	*5´ SOUTH OF TOW PATH ROAD; 120´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	81-LL	*20´ SOUTH OF TOW PATH ROAD; 50´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	82-LL	*25´ SOUTH OF TOW PATH ROAD;
	83-LL	*35´ SOUTH OF TOW PATH ROAD; 75´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	84-LL	*40´ SOUTH OF TOW PATH ROAD; 85´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	85-LL	*20´ SOUTH OF TOW PATH ROAD; 95´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	86-LL	*40´ SOUTH OF TOW PATH ROAD; 60´ WEST OF AN IMAGINARY LINE FROM THE WEST SIDE OF THE ROAD PERP. TO TOW PATH ROAD
	87-LL	*REF POND: 42´ WEST OF ROAD SOUTH OF POND; 35´ N/E OF ROAD SOUTH WEST OF POND
	88-LL	*REF POND: 12´ WEST OF ROAD SOUTH OF POND; 35´ N/E OF ROAD SOUTH WEST OF POND
	PA-01	*NORTH BLDG. 54 BETWEEN BLDG. 53 & BLDG. 54
	PA-02 COMPOSITE	*COMPOSITE OF PA-02-A & PA-02-B
	PA-02-A	*3´ NORTH OF TANK T-44
	PA-02-B	*3´ SOUTH OF TANK T-44
	PA-03 COMPOSITE	*COMPOSITE OF PA-03-A; & PA-03-B
	PA-03-A	*3´ NORTHWEST OF TANK T-44

SAMPLING LOCATIONS
5 MARCH 1987 TO PRESENT

DATE	GIV ID.	TYPE/ORIGIN
89/03/18	PA-03-B	*2´ WEST OF SOUTHWEST CORNER OF TANK T-44
	PA-04 COMPOSITE	*COMPOSITE OF PA-04-A;PA-04-B; & PA-04-C
	PA-04-A	*2´ NORTH OF THE NORTHWEST CORNER OF TANK T-15
	PA-04-B	*2´ WEST OF TANK T-18
	PA-04-C	*2´ SOUTH OF THE SOUTH WEST END OF TANK T-21
	PA-05	*SOUTH OF BLDG. 55/56
	PA-06 COMPOSITE	*COMPOSITE OF PA-06-A & PA-06-B
	PA-06-A	*SOUTH OF BLDG. 53/54
	PA-06-B	*SOUTH OF BLDG. 54/55
	PA-07	*3´ NORTH OF THE N/W/ CORNER OF BLDG. 58
	PA-08 COMPOSITE	*COMPOSITE OF PA-08-A PA-08-B; PA-08-C; & PA-08-D
	PA-08-A	*3´ N/W OF THE N/W CORNER OF TANK T-47
	PA-08-B	*2´ WEST OF TANK T-27
	PA-08-C	*2´ S/W OF THE S/W CORNER OF TANK T-22
	PA-08-D	*3´ S/W OF THE S/W CORNER OF BLDG. 58
	PA-09 COMPOSITE	*COMPOSITE OF PA-09-A & PA-09-B
	PA-09-A	*3´ NORTH OF TANK T-47 2´ RIGHT OF CEMENT PAD NORTH OF TANK
	PA-09-B	*3´ SOUTH OF THE MIDDLE OF TANK T-T-33
	SWEEP; BLDG. 54	*40 SQ. FT. OF FLOOR DIRT
	WIPE: 54	2 WIPES; 1 EA.; N & S WALLS; 9.25 SQ. FT.

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State of New Jersey
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Division of Responsible Party Site Remediation
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Scott A. Weiner
Commissioner

Karl J. Delaney
Director

DEC 17 1991

DEC 13 1991

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
NO. P713 404 262

Mr. Len Levy-Director Quality Assurance
Givaudan Corporation
125 Delawanna Avenue
Clifton, NJ 07015-5034

Dear Mr. Levy:

Re: Feasibility Study
Givaudan request for NJDEPE review of a proposed 20ppb dioxin soil cleanup level at the Givaudan site in Clifton, New Jersey.

Continuation and submittal of the Feasibility Study.

(reference the following letters)
1.)Givaudan letter to NJDEP dated January 21, 1991.
2.)NJDEP letter to Givaudan dated February 4, 1991.
3.)Givaudan letter to NJDEP dated February 15, 1991.
4.)NJDEP letter to Givaudan dated March 21, 1991.
5.)Givaudan letter to NJDEP dated April 25, 1991.

As requested by Givaudan, NJDEPE has reviewed the proposal for a 20ppb dioxin soil cleanup level to be applied at the Givaudan site in Clifton New Jersey and submits to Givaudan the following response.

NJDEPE has concluded that Givaudan's proposal for a 20ppb dioxin (2,3,7,8-TCDD) soil cleanup level is an acceptable site specific cleanup level for the Givaudan site. This site specific 20ppb 2,3,7,8-TCDD soil cleanup level will not pose an unacceptable concern for public health and the environment provided the protection of ground water is not a concern for drinking water purposes.

The use of the 20ppb 2,3,7,8-TCDD soil cleanup level at the Givaudan site is approved provided each of the following contingencies listed below are strictly adhered to and written documentation item by item of such is provided in detail to the Department in the Feasibility Study Report.

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SPECIFIC CONTINGENCIES TO BE INCLUDED IN THE FEASIBILITY STUDY REPORT

a.) The site or portion(s) of the site which contains or will contain less than or equal to (20ppb) 2,3,7,8-TCDD levels must be deed restricted to not allow land use change. Givaudan must provide specific plot plans (maps) of the area(s) which contain or will contain 2,3,7,8-TCCD soil less than or equal to (20ppb).

b.) The site or portion(s) of the site which contains or will contain less than or equal to (20ppb) 2,3,7,8-TCDD levels must be deed restricted to not allow the disturbance of dioxin contaminated soils.

c.) The site or portion(s) of the site which contains or will contain greater than (20ppb) 2,3,7,8-TCDD must be addressed as a discrete and separate issue within the Feasibility Study and the approach to remediation of the greater than 20ppb 2,3,7,8-TCDD contaminated soil must be clearly stated as such.

d.) The site or portion(s) of the site which contains or will contain less than or equal to (20ppb) 2,3,7,8-TCDD levels must be covered with a minimum of 2 (two) feet of clean fill.

e.) Surface runoff must be controlled such that nearby surface waters are not adversely impacted by residual contamination.

f.) Givaudan must use the enclosed document "DECLARATION OF ENVIRONMENTAL RESTRICTIONS AND GRANT OF EASEMENT" (attached) that will apply to contingencies (a) and (b) above to effectively satisfy the deed restriction clauses necessary to allow the use of the 20ppb 2,3,7,8-TCDD soil cleanup level. Failure of Givaudan to critically and thoroughly address the deed restriction issue and mechanism for implementation from a legal and technical perspective will result in, at a minimum, delayed Departmental review and possible complete revocation of the 20ppb cleanup level at the Givaudan site.

The Department will have a representative from the Division of Law review Givaudan's selected deed restriction wording, if necessary.

INCORPORATION OF DEED RESTRICTION PROCESS INTO THE FEASIBILITY STUDY

1.)Givaudan must submit the Draft Feasibility Study along with the exact proposed 2,3,7,8-TCDD contaminated soil property locations referencing lots and blocks and/or specific measurements within each lot and block. NJDEPE will issue approval of the property locations and Givaudan's proposed remediation approach before directing Givaudan to proceed with the "DECLARATION OF ENVIRONMENTAL RESTRICTIONS AND GRANT OF EASEMENT" document preparation.

Final written approval of the Feasibility Study and proposed action would be contingent upon Givaudan submitting the "DECLARATION OF ENVIRONMENTAL RESTRICTIONS AND GRANT OF EASEMENT" document back to NJDEPE with the appropriate references and signatures etc.

Once the "DECLARATION OF ENVIRONMENTAL RESTRICTIONS AND GRANT OF EASEMENT" document has been found to be acceptable to the Department, Givaudan will be granted a formal Feasibility Study approval in writing. Givaudan will then proceed with the actual Draft Design submittal to be reviewed and approved by NJDEPE.

g.) Givaudan must send a copy of the Draft Feasibility Study along with a brief cover letter to the Clifton Health Department for their information and files. Please copy (cc) NJDEPE on the cover letter. This requirement is in keeping with the Departments effort to inform Local Health Department's of major milestones related to NJDEPE's site cleanup efforts as part of our requirements of the CEHA (County Environmental Health Act).

The Feasibility Study Workplan dated September 12, 1989 has been approved, therefore Givaudan will proceed with the performance of the workplan as outlined in the plan along with conforming to all of the Department's comments stated above to be included in the Feasibility Study Report.

In conformance with Givaudan's letter to the Department dated January 21, 1991, page 2, last paragraph, Givaudan's schedule for submittal of the Draft Feasibility Study will resume as follows:

Givaudan must submit the Draft Feasibility Study to the Department within (75) seventy-five calendar days from receipt of this letter. The Department believes it has been accommodating to Givaudan's requests for pertinent information related to the performance of the Feasibility Study. The Department also believes that no further delays or information requests on either parties behalf will be necessary to complete and submit the Draft Feasibility Study.

If you have any questions concerning the content of this letter please contact me at (609) 633-0719.

Sincerely,

David Sweeney

David Sweeney, Section Chief
Bureau of State Case Management

cc:w/o (attachment) document

Nicholas Eisenhauer, BSCM
Joe Karpa, Section Supervisor, BSCM
Ann Charles, BEERA
Kevin Shick, Section Chief, BEERA
Kate Joyce, Section Chief, BEERA/ETRA
Bill Lowry, Research Scientist, BEERA/ETRA
Sarah Kinsel, Supervisor, BGWPA
Ellen Joukainen, Geologist, BGWPA

cc: HT

Status: (C) Remedial Investigation - Completed
(A) Feasibility Study Workplan - Approved
(U) Feasibility Study - Underway
( ) Feasibility Study Report
( ) Treatability Study
( ) Remedial Action Plan
( ) Design
( ) Construction
( ) Operation & Maintenance
( ) Dioxin subsite

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BRACH, EICHLER, ROSENBERG, SILVER, BERNSTEIN, HAMMER & GLADSTONE

A PROFESSIONAL CORPORATION

COUNSELLORS AT LAW

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November 3, 1995

Robert T. Tavares,
Chief Legal Counsel
Givaudan-Roure Corporation
Legal Department
125 Delawanna Avenue
Clifton, New Jersey 07014

Re: Migration of Dioxin Contamination from Givaudan Property to Neighboring Clini-Cab Property

Dear Mr. Tavares:

Our Firm represents Clini-Cab, the owner of property on River Road located adjacent to Givaudan's Clifton facility. We are aware of the extensive dioxin contamination which has been documented by the New Jersey Department of Environmental Protection ("DEP") and the U.S. Environmental Protection Agency ("EPA") on the Givaudan property in close proximity to the border with Clini-Cab.

Recently, consultants for Clini-Cab collected a sample on the Clini-Cab property along its border with Givaudan and had that sample analyzed for dioxin. As you will note from the attached analytical report, those results confirmed that dioxin has migrated from the Givaudan property and is present on the Clini-Cab property.

Although the DEP has not established any specific cleanup standard or guideline for dioxin-contaminated soil, Clini-Cab is understandably quite concerned about the migration of dioxin from Givaudan to its property, because of the documented extremely hazardous nature of dioxin. Consequently, it is imperative that this situation be corrected without delay.

We are bringing these test results to Givaudan's attention prior to making any notification to DEP or other environmental authorities. We are hopeful that you will immediately work with

Clini-Cab to arrive at a satisfactory solution to this problem which will remove all dioxin contamination from Clini-Cab property. I suggest that you contact me regarding these results at your earliest convenience.

I look forward to hearing from you.

Yours truly,

William J. Fried

WILLIAM J. FRIEDMAN

WJF/cc
Enc.
238938

[illegible]

TL-RTP Project: 33416
Client Sample: 001

Method 8290 PCDD/PCDF Analysis (b)
Analysis File: W269102

Client Project:	291 River Road				
Sample Matrix:	SOIL	Date Received:	07/14/95	Spike File:	SPX2372S
TLRTP ID:	103-88-1	Date Extracted:	07/18/95	ICAL:	WF57195
		Date Analyzed:	07/27/95	CONCAL:	W952692
Sample Size:	11.035 g	Dilution Factor:	10X	% Moisture:	9.3
Dry Weight:	10.009 g	Blank File:	W268705	% Lipid:	n/a
GC Column:	DB-5	Analyst:	JF	% Solids:	90.7

Analytes	Conc (ppt)	DL	EMPC	Ratio	RT	Flags
2,3,7,8-TCDD	246			0.79	19:24	—
1,2,3,7,8-PeCDD	ND	34.9				—
1,2,3,4,7,8-HxCDD	ND	49.0				—
1,2,3,6,7,8-HxCDD	ND	45.7				—
1,2,3,7,8,9-HxCDD	ND	44.2				—
1,2,3,4,6,7,8-HpCDD	EMPC		137			—
1,2,3,4,6,7,8,9-OCDD	6050			0.84	33:23	—
2,3,7,8-TCDF	22.1			0.87	18:26	—
1,2,3,7,8-PeCDF	ND	18.6				—
2,3,4,7,8-PeCDF	43.9			1.57	24:05	—
1,2,3,4,7,8-HxCDF	ND	31.7				—
1,2,3,6,7,8-HxCDF	ND	23.0				—
2,3,4,6,7,8-HxCDF	ND	30.5				—
1,2,3,7,8,9-HxCDF	ND	33.5				—
1,2,3,4,6,7,8-HpCDF	42.5			0.89	30:05	—
1,2,3,4,7,8,9-HpCDF	ND	43.5				—
1,2,3,4,6,7,8,9-OCDF	EMPC		97.1			—

Totals	Conc (ppt)	Number	DL	EMPC	Flags
Total TCDD	246	1			—
Total PeCDD	ND		34.9		—
Total HxCDD	137	2		166	—
Total HpCDD	282	1		419	—
Total TCDF	193	3		319	—
Total PeCDF	1660	5			—
Total HxCDF	9850	4		9960	—
Total HpCDF	98.8	2		116	—

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GIVAUDAN - ROURE

NOV 15 1995

November 9, 1995

Mr. Joseph Karpa
Division of Responsible Party Site Remediation
Bureau of State Case Management
New Jersey Department of Environmental Protection
CN 028 - 5th Floor
401 East State Street
Trenton, New Jersey 08625-0028

Re: Givaudan Consent Order TCDD

Dear Mr. Karpa,

As a follow up to a recent discussion with Ms. Linda Grayson, this is to inform you that on November 6, 1995, we received a letter dated November 3, 1995 from attorneys representing Clini-Cab Company of 291 River Road, Clifton, N.J. For reference, the Clini-Cab property borders the Givaudan-Roure property on the southern boundary of the site. Based on a broad interpretation of paragraph 28 of the Amended Administrative Consent Order TCDD executed February 16, 1988 and our continued commitment to an open communications policy with the Department, we are forwarding a copy of this correspondence for your files.

Unfortunately, the laboratory report attached to the letter was a telefax copy and the legends are difficult to read. As a matter of clarification, the column headings are listed below:

analyte	conc. (ppt.)	DL	EMPC	Ratio	RT	Flags

As can be seen in the laboratory report, 2,3,7,8-TCDD concentration, allegedly obtained from their border with our property boundary has been found to be 0.246 ppb (parts per billion) (246 parts per trillion). It is our understanding that 2,3,7,8-TCDD levels in soil which are below one (1) ppb (part per billion) (one thousand parts per trillion) are considered by the Department to require no remedial action.

BBA000053

GIVAUDAN - ROURE CORPORATION
Delawanna Avenue, Clifton, New Jersey 07015-5034 • Tel: (201) 365-8000 • Telex 21959 giva ur
Fax (201) 365-1015 (Headquarters) (201) 365-0711 (Plant)

As a matter of record, the enclosed letter and attachment are the only details provided to us to date.

We will be informing Clini-Cab's attorneys that we have forwarded their correspondence to the Department. Should you have any comments or questions please contact me at (201) 365-8553.

Sincerely,

Leonard A. Levy
Director, Site Remediation

cc: Linda Grayson (w/attachments)

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GIVAUDAN - ROURE

Fragrances - Specialties

May 30, 1996

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JUN - 4 1996

Ms. Maria Franco-Spera
Division of Responsible Party Site Remediation
Bureau of State Case Management
New Jersey Department of Environmental Protection
CN 028, 5th Floor
401 East State Street
Trenton, New Jersey 08625-0028

Re: Ethylene Dichloride (1,2 Dichloroethane)

Dear Ms. Franco-Spera:

In our last meeting and during recent telephone conversations, the Department expressed concern regarding ethylene dichloride (1,2 dichloroethane) in ground water. The concern was not necessarily the detected concentrations of ethylene dichloride, but the fact that a "source area" had not been identified.

As discussed in recent telephone conversations and summarized in this letter, 1,2 dichloroethane was utilized as a solvent system in the manufacture of Hexachlorophene USP, a pharmaceutical grade product. From the commencement of the manufacture of Hexachlorophene USP (approximately 1945) to cessation of the manufacturing process (1984), large quantities of ethylene dichloride were purchased and utilized in the process. The manufacture of Hexachlorophene USP was performed predominantly in Buildings 58, 59 and 60. Ethylene dichloride was stored in an underground storage tank west of Building 60 (UST T-35) and pumped to the reactors. In the early 1970's, manufacture of Hexachlorophene was transferred to Building 9. Processing in this facility continued through 1972. During this period, ethylene dichloride was stored in two underground storage tanks (UST T-23 and T-62).

In view of the large quantities of ethylene dichloride utilized at the site over a 40+ year period, the detection of low levels of ethylene dichloride in the ground water is not unrealistic. However, review of the analytical data from the recent soil boring investigation, groundwater monitoring wells, and from the underground storage tank closure activities, does not indicate a significant source area for ethylene dichloride detected in the groundwater. The removal of the underground storage tanks at the northeast corner of Building 9 (UST T-23 and T-62), and west of Building 60 (UST T-35), showed no evidence of ethylene dichloride. Monitoring well group 8, which includes a shallow and a deep well, did not indicate levels of ethylene dichloride exceeding NJDEP Ground Water Quality Standards.

BBA000017

In the area of Buildings 58, 59 and 60, 3 soil borings (MSB5DS52, MSB6DS52 and MSB7DS52) were extended to 12 feet with no indication of ethylene dichloride. In reviewing the Revised Draft RI Report Volume I (revised September 1991), a 1968 ethylene dichloride spill was identified west of the area between buildings 52 and 58. This area was not originally investigated due to Dioxin impacted soils. If the Department believes investigation of this reported spill will complete the investigation for an ethylene dichloride source area, a proposal to sample adjacent to the Dioxin area West of Building 52 will be prepared and provided for the Department's review.

The data generated in the soil and groundwater investigations do not suggest the presence of a significant source area. It is believed that the ethylene dichloride detected in the groundwater monitoring wells has likely resulted from numerous years (1940 to 1984) of manufacturing activity utilizing large quantities of ethylene dichloride. Ethylene dichloride has not been utilized on the site in the past 12 years (1984 to date).

I trust the above information will provide the Department some guidance in understanding and rationalizing the low levels of ethylene dichloride detected in the ground water during the most recent ground water sampling.

If you require any further information with regard to this matter, please do not hesitate to contact me.

Sincerely,

Leonard A. Levy
Director, Site Remediation

LAL:ms
mfs-eth.my6

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— ENVIRONMENTAL ENGINEERING SERVICES
628 ROUTE 10 WHIPPANY, NJ 07981 (201) 884-2111

September 20, 1983

Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

Attention: Mr. William Turetsky
Director of Safety &
Environmental Protection

RE: CHEMICAL SEWER INVESTIGATION

Gentlemen:

The following report has been prepared to summarize and list the data obtained in our investigation of the Chemical Sewer at your Clifton, New Jersey plant. The data includes information obtained in the inspection of manholes, sewers and connections, including the video inspection of the sewer system. All video tapes of the internal inspection are available for further reference. Convenient summaries of the investigations have been prepared and included in the various sections of the report. A map of the chemical sewer and its branches showing the results of the investigation in symbolic terms, is also included.

The investigation of the chemical sewer identified many reaches of the system as containing piping defects that may allow exfiltration of process waste from the chemical sewer and its branches during typical daily plant operation. Estimates of the potential of leakage from the various segments of the system have been prepared and are included in the report.

The potential for significant leakage at several locations is high. As such, we recommend that repairs to the piping system be undertaken in those locations where significant deterioration or breakage has occured. Although significant defects were found in the system, it is our opinion that repairs can be made to the sewer to continue its usefullness into the future while limiting (as much as possible) the amount of leakage occuring.

GIVAUDAN CORPORATION

CLIFTON, NEW JERSEY

CHEMICAL SEWER INVESTIGATION

CHEMICAL PLANT

SEPTEMBER 1983

CFM INCORPORATED
ENVIRONMENTAL ENGINEERING SERVICES
628 ROUTE 10, WHIPPANY, NEW JERSEY

This report provides data upon the condition of the chemical sewer and its branches. A subsequent report will identify rehabilitati alternatives for the repair or replacement of the chemical sewer and its branches. Should you have any questions on the data obtained during this investigation, please advise.

Very truly yours,

CFM INCORPORATED

John J. Flood, P.E.

JJF:car
Attachments

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

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1.0 INTRODUCTION

An investigation was undertaken of the chemical sewer and its various branches and connections at the Givaudan Corporation chemical plant in Clifton, New Jersey. The investigation was directed at obtaining specific information and data upon the condition of the chemical sewer and further upon the potential for exfiltration from the sewer. The investigative work was accomplished by experienced field personnel under an excelerated time schedule in order to accomplish as much of the work as possible during a plant shutdown in late July, 1983. The investigation included the inspection of each manhole and chamber providing access to the chemical sewer and its branches; an internal inspection of each reach of the chemical sewer and its branches utilizing closed circuit television equipment; hydrostatic testing of each reach of the chemical sewer and its branches to determine the potential for exfiltration and the inspection of each connection to the chemical sewer and its branches. All data and information obtained during the investigation are shown on individual report forms, copies of which are contained in the Appendix of this report. Summaries of all data obtained are included in the various sections of this report. Additionally, all video tapes obtained during the inspection are available for review. Copies of photographs obtained in each manhole are contained in the Appendix of this report.

The investigation indicated that many defects are present within the piping system and structures comprising the chemical sewer and its branches. Defects identified included misaligned and open joints in the piping system (that have a potential for exfiltration), as well as cracked and broken pipe in many locations. Some of the manhole structures were also found to be in poor condition. The results of the exfiltration hydrostatic test suggested a potential for leakage from the system. Although some leakage can be expected from all piping systems constructed of similar materials utilized in the chemical sewer, the leakage from this particular system was felt to be higher than normal. Many segments of the system, however, were found to be in reasonable condition.

An inspection of the connections to the chemical sewer and its branches found many locations where exfiltration could occur. Significant deterioration of discharge troughs, traps and connections were evident - providing locations where direct exfiltration could occur.

2.0 MANHOLE INSPECTION

An inspection was made of all manholes and structures on the chemical sewer and its branches. The inspection was undertaken by experienced personnel to determine the structural condition of the various manhole components, as well as pipe defects detectable from the manhole. All observations of the field personnel were recorded on manhole inspection reports, copies of which are included in the Appendix of this report. In addition to the structural condition of the manhole and piping system, the depth, construction material of the manhole and pipe size and materials were also recorded. Infiltration sources observed in manholes were identified and the rate of leakage estimated or quantified where possible. Potential inflow sources, mainly through the manhole cover and frame were also noted. The various manhole components inspected included the cover; the frame; the riser (the section between the manhole wall and the manhole frame); the channel; the benching and the wall joints. The incoming and outgoing pipes in each manhole were "lamped" (inspected using high intensity light) where possible and defects such as joint misalignment, broken pipe and leaking joints were noted. This inspection was limited to 10 - 20 feet from the manhole due to visual limitations.

The chemical sewer and branches contained 41 manholes and 14 chambers or entrance structures. Each manhole or structure was identified by a specific number starting with the first manhole at the sewer connection to the City of Clifton sewer system and proceeding upstream. Branches to the chemical sewer were numbered from the connection manhole with a subscript.

Table No. 1 is a summary of the manhole inspections performed. Most of the manholes in the system were found to be in reasonable condition, expecially along the chemical sewer. Many of the pits contained on the branches to the chemical sewer were found to contain no channels (to carry the flow through the pit). Without these channels the base of the pits were eroded in many cases. Likewise, some of the manholes on the branch sewers were without benching or channels that affected the flow conditions in the manholes and the condition of the base. No attempt was made to hydrostatic test each manhole or pit, however, it was evident that some leakage must be occuring from some of the structures, especially in the branches.

TABLE 1

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF MANHOLE INSPECTION

MANHOLE NUMBER	LOCATION	STRUCTURAL CONDITION FRAME/COVER	WALLS	BASE	CONSTRUCTION MATERIAL	PIPE SIZE	DESCRIPTION OF DEFECTS
1	Chemical sewer	Wood-poor	Good	Good	Precast-Acid Brick	18"VCP	None evident
2	Chemical sewer	NOT INSPECTED DUE TO PRESENCE OF pH PROBE					None evident
3	Chemical sewer	Good	Good	ND	Block	18"VCP	None evident
4	Chemical sewer	None-Grate	Good	Good	Block	18"VCP	None evident
5	Chemical sewer	Good	Good	Good	Block	18"VCP	None evident
6	Chemical sewer	Wood	Good	ND	Precast	18"VCP	None evident
7	Chemical sewer @ Lime Tower	Wood	Good	ND	24"VCP	18"VCP	None evident
8	Chemical sewer @ Lime Tower	Good	Good	Good	Block	18"VCP	None evident
9	Chemical Sewer	NOT INSPECTED DUE TO PRESENCE OF pH PROBE				18"VCP	None evident
9-1	Branch-to Bldg. 95	Good	Good	None	Block-Acid Brick	12"VCP	No bench or channel
9-2	Branch-to Bldg. 95	Fair (shifted)	Worn	None	Block-Acid Brick	12"VCP	No bench or channel
9-3	Branch-to Bldg. 95			None	Block-Acid Brick	12"VCP	No bench or channel
10	Chemical sewer	Good	Good	Good	Block	18"VCP	Poor connection of side line
10-1	Branch-to Bldg. 79	NO MANHOLE - CLEAN OUT					
11	Chemical sewer	Good	Good	Worn	Block-Acid Brick	18"VCP	None evident

932790105

MANHOLE NUMBER	LOCATION	STRUCTURAL CONDITION FRAME/COVER	WALLS	BASE	CONSTRUCTION MATERIAL	PIPE SIZE	DESCRIPTION OF DEFECTS
11-1	Branch-to Bldg. 68	Worn	Good	Worn	Block	18/15"VCP	No channel
11-2	Branch-to Bldg. 68	Good	Good	Fair	Brick	18/15"VCP	None evident
11-3	Branch-to Bldg. 68	Worn	Good	Good	Brick	15"VCP	None evident
11-5	Branch-to Bldg. 58	Worn	Worn	None	Brick	10/12"VCP	None evident
11-7	Branch-to Bldg. 75	Good	Worn	Good	Block	12"VCP	None evident
11-8	Branch-chemical sewer	Loose	Worn	Worn	Brick	10/15"VCP	Poor channel
11-10	Branch-chemical sewer	Good	Worn	Loose	Block	12"VCP	Poor channel
11-11	Branch-chemical sewer	Worn	Worn	Worn	Brick	12"VCP	None evident
11-13	Branch-chemical sewer	Worn	Worn	Fair	Brick-Acid Brick	18"VCP	None evident
11-14	Branch-chemical sewer	None	Good	Poor	Precast/Brick	10"VCP	Poor channel
11-15	Branch-chemical sewer	Worn	Worn	Poor	Precast/Brick	15"VCP	Poor channel & walls
11-16	Branch-chemical sewer	Worn	Worn	None	Brick	12"VCP	Poor channel & benching
11-18	Branch-chemical sewer	None	None	None	3x3 Concrete Pit	8"VCP	None evident
12	Chemical sewer	Good	Worn	Worn	Block	18"VCP	None evident
13	Chemical sewer	Good	Good	Worn	Block	18"VCP	None evident
13-1	Branch-chemical sewer	Good	Good	None	Block	12"VCP	No benching
13-2	Branch-chemical sewer	Worn	Worn	None		18"VCP	Poor benching & channel
13-3	Branch-chemical sewer	Worn	Loose	Worn	Brick	18"VCP	Poor channel
13-5	Branch-chemical sewer	**CONCRETE PIT - NOT MANHOLE**			Concrete	8"CIP	None evident
13-6	Branch-chemical sewer	**DRAIN INLET - NOT MANHOLE**			Concrete	-	Abandoned
13-7	Branch-chemical sewer	**BRICK PIT - NOT MANHOLE**			Brick	8"VCP	None evident
13-8	Branch-chemical sewer	**CONCRETE PIT - NOT MANHOLE**			Concrete	10"VCP	Poor channel
13-9	Branch-chemical sewer	**CONCRETE PIT - NOT MANHOLE**			Concrete	6"VCP	Poor channel - bulkhead
13-10	Branch-chemical sewer	**CONCRETE PIT - NOT MANHOLE**			Concrete	6"VCP	Poor channel - bulkhead
13-13	Branch-chemical sewer	Worn	Good	None	Block	6"VCP	No channel
13-14	Branch-chemical sewer	**CONCRETE PIT - NOT MANHOLE**			Concrete	Not Visible	Poor walls - surcharged
13-12	Branch-chemical sewer	**CONCRETE PIT - NOT MANHOLE**			Concrete	6"CIP	No channel

MANHOLE NUMBER	LOCATION	STRUCTURAL CONDITION FRAME/COVER	WALLS	BASE	CONSTRUCTION MATERIAL	PIPE SIZE	DESCRIPTION OF DEFECTS
13-15	Branch-chemical sewer	Worn	Worn	None	Block	6"VCP	Poor channel - no benching
13-17	Branch-chemical sewer	Worn	None	None	24"VCP Pipe	6"VCP	Poor channel - no benching
14	Chemical sewer	Good	Good	Good	Block	24"VCP	None evident
15	Chemical sewer	Worn	Worn	Poor	Block	24"VCP	Poor channel
16	Chemical sewer	Worn	Worn	Poor	Block	24"VCP	Poor channel
17	Chemical sewer	Worn	Good	Poor	Block	18"VCP	Poor channel
17-1	Branch-chemical sewer	CONCRETE PIT - NOT MANHOLE			Concrete	8"VCP	No channel
18	Chemical sewer	Worn	Worn	Worn	Block	18"VCP	None evident
19	Chemical sewer	Worn	Broken	Worn	Brick	15"VCP	Poor walls & channel
20	Chemical sewer	None	Good	Poor	Brick	10"VCP	Poor channel
21	Chemical sewer	CONCRETE PIT - NOT MANHOLE			Concrete	8"VCP	Poor channel
22	Chemical sewer	CONCRETE PIT - NOT MANHOLE			Precast Concrete	8"VCP	Poor channel
23	Chemical sewer	CONCRETE PIT - NOT MANHOLE			Concrete Pit	10"VCP	Pit in poor condition
24	Chemical sewer	BRICK PIT - NOT MANHOLE			Brick Pit	10"VCP	Poor channel
25	Chemical sewer	PIT CANNOT BE INSPECTED DUE TO PRESENCE OF NOXIOUS GASES					

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3.0 HYDROSTATIC TESTS

Each segment of the chemical sewer and its branches were tested, where possible, utilizing hydrostatic pressure to develop an estimate of potential exfiltration. The work was accomplished utilizing specially designed "plugs" that were installed in the sewer to isolate the reach and allow the development of a small pressure head in the sewer. Once developed the rate of water required to maintain the pressure head was measured over a short period of time. The measured rate was determined to be the exfiltration from the sewer reach under a small pressure head.

Some reaches could not be tested utilizing the above procedure in that pipe defects prevented the insertion of the necessary plugs. At these locations the pipe was filled with as much water as possible utilizing a temporary dam and again the leakage rate estabilshed but under a non-pressure head. The results of the hydrostatic tests are included in the Appendix of this report.

A summary of the results of the testing has been prepared as Table No. 2. The Table identifies the characteristics of the sewer reach being tested in terms not only of its length and diameter but also of the product of these two dimensions. A normal piping system constructed of vitrified tile pipe would be expected to leak through the joints of the pipeline (assuming the pipe is structually intact). The amount of leakage would

TABLE 2

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF HYDROSTATIC TEST RESULTS

MANHOLE REACH FROM	MANHOLE REACH TO	PIPE DIMENSIONS SIZE (Inches)	PIPE DIMENSIONS LENGTH (Feet)	PIPE DIMENSIONS INCH-FEET	MEASURED EXFILTRATION RATE (GPM)	UNIFIED EXFILTRATION RATE (GPD/In-Ft)	POTENTIAL DAILY EXFILTRATION (GPD)
A. CHEMICAL SEWER							
1	2	18	17	306	0	0	0
2	Pit 35	18	38	684	0	0	0
Pit 35	3	18	19	432	0	0	0
3	4	18	64	1422	5.4	5.5	1300
Pit 74	6	18	265	4590	8.6	2.7	2400
9	10	18	141	2538	8.6	4.9	2400
10	11	18	121	2178	> 60.0	39.7	5700
11	12	18	235	4230	20.3	6.9	1800
12	13	18	38	684	11.0	23.2	1700
13	14	24	42	1281	COULD NOT TEST		-
14	15	24	140	3360	20.0	8.6	1100
15	16	24	67	1608	6.0	5.4	400
16	17	18	48	864	20.0	33.3	800
17	18	18	122	2196	14.3	9.4	700
18	19	15	82	1302	27.8	30.7	4200
19	20	10	82	820	41.7	73.2	3900
20	21	10	43	430	1.6	5.4	300
21	22	8	48	384	> 60.0	>225.0	4800
22	23	8	250	2000	> 60.0	> 43.2	4000

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MANHOLE REACH FROM	TO	PIPE DIMENSIONS SIZE (Inches)	LENGTH (Feet)	INCH-FEET	MEASURED EXFILTRATION RATE (GPM)	UNIFIED EXFILTRATION RATE (GPD/InFt)	POTENTIAL DAILY EXFILTRATION (GPD)
B. BRANCH SEWER (STARTING @ MANHOLE 9)							
9	9-1	12	158	1896	62.5	47.5	2100
9-1	9-2	12	45	540	11.1	29.6	1000
9-2	9-3	12	42	504	9.6	27.4	300
9-2	9-5	12	74	888	760.0	> 97.3	5200
9-3	9-4	8	43	344	COULD NOT TEST		-
C. BRANCH SEWER (STARTING @ MANHOLE 10)							
10	10-1	12	358	4296	2.0	0.7	200
D. BRANCH SEWER (STARTING @ MANHOLE 11)							
11	11-1	18	78	1404	16.7	17.1	1700
11-1	11-2	15	103	1545	29.4	27.4	2300
11-2	11-3	18	26	468	0	0	0
11-3	11-4	10	161	1610	> 60.0	> 53.7	2100
11-3	11-5	12	38	456	> 60.0	> 189.5	2400
11-5	11-6	10	163	1630	1.5	1.3	200
11-2	11-7	12	232	2784	8.8	4.6	1100
11-7	11-8	18	48	864	> 60.0	> 100.00	3000
11-8	11-9	10	154	1540	29.4	27.5	3800
11-7	11-10	12	72	864	4.9	8.2	400
11-10	11-11	12	34	408	8.6	30.4	700
11-11	11-12	10	164	1640	> 60.0	> 52.7	2600
11-11	11-13	18/15	63	1044	20.0	27.6	1700
11-13	11-14	10	46	460	10.0	31.3	900
11-13	11-15	12	66	792	COULD NOT TEST		-
11-15	11-16	12	22	264	COULD NOT TEST		-
11-16	11-18	8	83	664	23.8	51.6	2000

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MANHOLE REACH FROM	TO	PIPE DIMENSIONS SIZE (Inches)	LENGTH (Feet)	INCH-FEET	MEASURED EXFILTRATION RATE (GPM)	UNIFIED EXFILTRATION RATE (GPD/In-Ft)	POTENTIAL DAILY EXFILTRATION (GPD)
E. BRANCH SEWER (STARTING @ MANHOLE 13)							
13	13-1	12	170	2040	6.5	4.6	300
13-2	13-3	18	26	468	COULD NOT TEST		-
13-3	13-4	8	57	456	5.4	17.1	200
13-4	13-5	8	14	112	0	0	0
13-4	13-7	8	54	392	1.0	3.7	100
13-7	13-8	8	25	296	> 60.0	> 291.9	2600
13-8	13-9	6	25	228	1.3	8.2	100
13-7	13-11	6	198	1296	25.0	27.8	1100
13-11	13-12	6	35	210	1.2	8.2	100
13-12	13-13	6	27	162	0.7	6.2	100
13-11	13-14	6	44	312	> 60.0	> 276.9	2600
13-14	13-15	6	59	354	10.7	43.5	400
F. BRANCH SEWER (STARTING @ MANHOLE 17)							
17	17-1	8	62	496	15.0	43.5	600
G. BRANCH SEWER (STARTING @ MANHOLE 19)							
19	19-1	10	128	1280	> 60.0	> 67.5	1500
H. BRANCH SEWER (STARTING @ MANHOLE 20)							
20	20-1	10	159	1590	> 60.0	> 54.3	1500

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be proportional to the circumference of the pipeline and the number of joints contained therein. Both of these factors are considered in the product of the diameter of the pipeline and its length. As such, the developed dimension of the pipeline, (in terms of inch/feet) is a means of evaluated leakage from the various segments of the chemical sewer and its branches on a unified basis. Table No. 2 also contains the measured exfiltration determined from the hydrostatic test, as well as the developed unified exfiltration rate, based upon the diameter and length of the individual segments. Finally, the Table contains an estimate of potential exfiltration from each segment of the chemical sewer and its branches in terms of Gallons Per Day (GPD) of leakage. This estimate was developed utilizing the measured exfiltration rate and the anticipated depth of gravity flow in each sewer segment, as well as the results of the internal inspection performed on the pipeline. As such, consideration was given for the rate measured, relative to the anticipated depth of flow in the sewer during a typical daily production cycle and the condition of the pipeline. Segments with broken pipe in the lower quadrants of the pipeline were given particular consideration, since the potential for exfiltration at these locations is significantly greater then through joint openings. Nevertheless, a poorly jointed or misaligned pipeline can produce significant exfiltration.

A summary of the potential daily exfiltration for the principle chemical sewer and each of its branches is shown hereafter.

SUMMARY OF POTENTIAL DAILY EXFILTRATION

BRANCH	GALLONS PER DAY	PRECENT OF TOTAL
Chemical sewer (main branch)	35,500	44.4
Branch starting @ MH-9	8,600	10.7
Branch starting @ MH-10	200	0.2
Branch starting @ MH-11	24,900	31.0
Branch starting @ MH-13	7,600	9.4
Branch starting @ MH-17	600	0.7
Branch starting @ MH-19	1,500	1.8
Branch starting @ MH-20	1,500	1.8
TOTAL FOR CHEMICAL SEWER	80,400	

The total estimated potential daily exfiltration was determined to be about 80,000 GPD. Of this total about 44% was thought to occur along the chemical sewer with the remaining 56% in the branches of the chemical sewer. Of the 7 branches to the chemical sewer, the principle branch (starting at manhole No. 11) was thought to produce the greatest amount of leakage (over 31% of the total). It is important to note, however, that the estimate of potential daily exfiltration was developed utilizing the results of an hydrostatic test performed under a low head condition. For the most part, this condition is not prevalent in the system and as such, the estimated daily exfiltration of 80,000 GPD should be considered only as an order of magnitude estimate. Of importance, however, is the location where the majority of leakage is occuring, namely along the main branch of the chemical sewer and the branch starting at manhole No. 11. These two piping systems were estimated to contribute over 75% of the exfiltration in the system while comprising only 65% of the total length of the system.

Plate "A" shows the results of the hydrostatic test procedure utilizing the developed unified exfiltration rate. A convenient symbol is included in the evaluation of each reach, based upon an estimate of minor, moderate and significant leakage. Most of the significant leakage was found to occur in the branches of the system rather then in the main chemical sewer.

4.0 BUILDING CONNECTION INVESTIGATION

An investigation of the building connections to the chemical sewer and its branches was undertaken to determine the potential for exfiltration from these connections. The original intention of the investigation of the building connections was to estimate leakage that could occur in each connection. This work was to be accomplished with the use of a "packer" assembly during the internal inspection of the chemical sewer or its branches. The "packer" will provide a seal of one end of the connection and allow the introduction of test water to the other end.

During the internal inspection of the chemical sewer and its branches it was found that the introduction of the Packer assembly could not be accomplished in many cases. As such, the sealing of one end of the connection was not possible.

As an alternative to this testing procedure a visual inspection of each of the connections was undertaken. The results of this inspection are shown on the following summary that includes a describtion of the connection by the field personnel performing the inspection. Connections were identified utilizing the building number and a letter subscript from the first connection at the downstream end of the building to the last connection at the upstream end. Plate "A" shows the number sequence utilized, for future reference.

Many of the connections were found to be in poor condition with open joints and cracks that could allow exfiltration.

No estimate, however, has been prepared of the amount of exfiltration that could occur at each connection. The summary of the inspection includes a determination of possible exfiltration for those connections that appeared to be in poor condition. Copies of the inspection description are included in the Appendix of the report.

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CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS: TROUGH SIZE	CONNECTION DIMENSIONS: CONNECTION SIZE	DESCRIPTION OF DEFECTS: TROUGH	DESCRIPTION OF DEFECTS: CONNECTION	POSSIBLE EXFILTRATION
9-4A, B, C, D	93	12" concrete	8" VTP	Worn	(see II)	CND
9-6A	94	12" concrete	8" VTP	Slightly worn	(see II)	CND
9-5A, B, C, D, E	95	None	4" VTP	None	CNI	CND
9-7A	95	None	4" VTP	None	CNI	CND
9-7B	95	None	4" Steel	None	CNI	CND
10-A	79	12" lead lined	CNI	Openings	CNI	CND
10-B	79	12" V.C.	CNI	Misaligned, cracks	CNI	Possible
10-C	80	12" V.C.	CNI	Misaligned, joints open	CNI	Possible
10-D	80	12" V.C.	CNI	Joints open, cracks	CNI	Possible
10-E	81	10" V.C.	CND	Grating prevented inspection	Cracks & breaks	Possible
10-F	81	12" V.C.	CNI	Fair condition	CNI	CND
10-G	82	12" V.C.	CND	Joints open, cracks @ invert	Appears good	Observed

CND - COULD NOT DETERMINE CNI - COULD NOT INSPECT II - INTERNAL INSPECTION

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CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS TROUGH SIZE	CONNECTION DIMENSIONS CONNECTION SIZE	DESCRIPTION OF DEFECTS TROUGH	DESCRIPTION OF DEFECTS CONNECTION	POSSIBLE EXFILTRATION
10-H	82	12" V.C.	CND	Joints open, cracks @ invert	Worn	Possible
10-I	83B	None	2-4" V.C.	None	Broken pipe observed	Possible
10-J, K	83A	None	CNI	None	CNI	CND
11-3A, B, C, D	68	COULD NOT LOCATE DUE TO EQUIPMENT & ACID SPILLS ON FLOOR				CND
11-5A	58	8" V.C.	CND	Inactive good	CNI	CND
11-5B	58	8" V.C.	CND	Some cracks joints good	Some cracks	Possible @ connection
11-5C	59	8" V.C.	CNI	Some cracks	CNI	CND
11-5D	59	8" V.C.	CND	Cracks at invert	Poor connection	Possible @ connection
11-5E	60	8" V.C.	CND	Good condition	Poor alignment	Possible @ connection
11-5F	60	8" V.C.	CND	Some joints open	CNI	CND
11-5G	61	8" V.C.	CND	Some cracks	Slightly worn	CND
11-5H	61	8" V.C.	CND	Joints open, broken pipe	Cracks in drain	Possible
11-5I	62	8" V.C.	CND	Good condition	Good condition	CND

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CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS TROUGH SIZE	CONNECTION DIMENSIONS CONNECTION SIZE	DESCRIPTION OF DEFECTS TROUGH	DESCRIPTION OF DEFECTS CONNECTION	POSSIBLE EXFILTRATION
11-5J	62	8" V.C.	CND	Limited access - inspenction difficult		CND
11-5K	63	8" V.C.	CND	Debris in drain	Good condition	CND
11-5L	63	8" V.C.	CND	Joints open, cracks	Good condition	Possible @ trough
11-5M	64B	None	2-C.O.	None	No visible defects	CND
11-9A	52	8" V.C.	CND	Joints open, cracks	CNI	CND
11-9B	52	8" V.C.	CND	Good condition	CNI	CND
11-9C	53	8" V.C.	CND	Good condition	CNI	CND
11-9D	53	8" V.C.	CND	Good condition	CNI	CND
11-9E	54	8" V.C.	CND	Minor cracks	Good condition	CND
11-9F	54	8" V.C.	CND	Joints open	Worn	Possible
11-9G	55					

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS		DESCRIPTION OF DEFECTS		POSSIBLE EXFILTRATION
		TROUGH SIZE	CONNECTION SIZE	TROUGH	CONNECTION	
11-9H	55					
11-9I	56	8" V.C.	CND	Joints open, cracks	Drains clogged	Possible
11-9J	56	8" V.C.	CND	Joints open, cracks	Drains clogged	Possible
11-9K	57	8" V.C.	CND	Joints open, cracks	CND	Possible
11-9L	57	8" V.C.	CND	Joints open, cracks	CND	Possible
11-8A	65	None	6" VCP	None	Open joint observed	Possible
11-11A	92	12" concrete	CND	Not in use	CND	CND
11-11B	42	12" V.C.	CND	Joints open, cracks	CND	Possible
11-11C	42	12" V.C.	CND	Joints open, cracks	Crack in drain	Possible
11-11D	43	12" V.C.	CND	Joints open	CNI	Possible
11-11E	43	12" V.C.	CND	Joints open	CNI	Possible
11-11F	44	12" V.C.	CND	Joints open, cracks	None evident	CND
11-11G	44	12" V.C.	CND	Joints open, cracks	None evident	CND

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS		DESCRIPTION OF DEFECTS		POSSIBLE EXFILTRATION
		TROUGH SIZE	CONNECTION SIZE	TROUGH	CONNECTION	
11-11H	45	12" V.C.	CND	Joints slightly open	Some cracks	Possible
11-11I	45	12" V.C.	CND	Joints slightly open	None	Possible
11-11J	46	12" V.C.	CND	Misaligned, slightly open	Joints open, crack	Porrible
11-11K	46	12" V.C.	CND	Misaligned slightly open	Joints open crack	Possible
11-11L	47	12" C.I.	CND	Good-some sealing needed	None evident	CND
11-11M	47	12" C.I.	CND	Good-some sealing needed	CND	CND
11-11N	75	12" C.I.	CND	Inactive drain	CND	CND
11-10A, B	200	None	6" VTP	None	Poor Alignment, open	Possible
11-14A, B, C, D, E F, G	36A	8" V.C.	CND	None evident	-	CND

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS		DESCRIPTION OF DEFECTS		POSSIBLE EXFILTRATION
		TROUGH SIZE	CONNECTION SIZE	TROUGH	CONNECTION	
11-14H	36B	6" concrete	CND	Slightly worn	CND	CND
11-14I	36B	None	CNI	-	Beneath floor	CND
11-14J	36B	8" V.C.	CND	Joint open slightly	CND	CND
11-16A	35	Drain inlet	4" VTP	-	Pipe misaligned	Possible
11-17A	35C	-	8" VTP	None	Joints open	Possible
11-13A	Cooling tower	None	Could not inspect	-	-	CND
11-19A	36B	None	CNI	None	Connection under floor	CND
13-1A	72	None	4" CIP	None	No visible defects	CND
13-2A	26	None	6" VTP	None	Broken pipe	Possible
13-3A	200	None	4" VTP	None	Slightly misaligned	CND
13-2B	200	None	CNI	Steam in manhole	CNI	CND
13-9A	89	10" concrete	CNI	slightly worn	CNI	CND

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS TROUGH SIZE	CONNECTION SIZE	DESCRIPTION OF DEFECTS TROUGH	CONNECTION	POSSIBLE EXFILTRATION
13-10A	89	10" concrete	CNI	slightly worn	CNI	CND
13-12A	7	None	4" CIP	None	None evident	CND
13-13A	7	None	6" CIP	None	None evident	CND
13-13B	7	None	CNI	None	CNI	CND
13-14A	7A	None	CNI	PIT SURCHARGED - COULD NOT INSPECT		CND
13-14B, C	7A	Concrete	6" VTP	Slightly worn	CND	CND
13-14D, E	7A	None	CND	Cleanouts surcharged	CNI	CND
13-15A, B, C, D	27	None	6" VTP	None	Misaligned joints on all	CND
13-17A	7	None	4" CIP	None	Fair condition	CND
13-17B	7	None	6" CIP	None	None evident	CND
16A, B, E, F, G	26	None	CND	COMPLETE INSPECTION NOT POSSIBLE - PIPE SECTION MISSING		Possible
16C, D	26	None	3" steel	None	Leaking connection to floor	Possible
18A	72	None	10" VTP	None	Could not inspect due to fumes	CND

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS TROUGH SIZE	CONNECTION SIZE	DESCRIPTION OF DEFECTS TROUGH	CONNECTION	POSSIBLE EXFILTRATION
19A	28	8" V.C.	CND	Good condition	Misaligned	CND
19B	28	8" Concrete	CND	Worn	Poor condition	Possible @ connection
19C	29	8" V.C.	CND	Joints open errosion	Fair	Possible in trough
19D	29	8" V.C.	CND	Worn	Worn	Possible
19E	30	8" V.C.	CND	Cracks @ invert	None evident	Possible in trough
19F	30	Plastic liner	CND	Flow spill over liner	CNI	Possible in trough
19G	31	8" concrete	CND	Worn	CNI	CND
19H	31	8" concrete	CND	Worn	CNI	CND
19I	32E	None	6" CIP	None	No visible defects	CND
20A	22	CND	CND	Boiling water being discharged	CNI	CND
20B	22	CND	CND	Boiling water being discharged	CNI	CND
20C	22	8" V.C.	CND	Some cracks	Poor condition	Possible

GIVAUDAN CORPORATION

CLIFTON - NEW JERSEY

CHEMICAL SEWER INVESTIGATION

SUMMARY OF BUILDING CONNECTION INVESTIGATION

CONNECTION DESIGNATION	BUILDING SERVING	CONNECTION DIMENSIONS		DESCRIPTION OF DEFECTS		POSSIBLE EXFILTRATION
		TROUGH SIZE	CONNECTION SIZE	TROUGH	CONNECTION	
20D	23	8" V.C.	CND	Joints open	Poor condition	Possible
20E	23	Concrete	CND	None evident	Poor condition	Possible
20F	24	4" concrete	CND	Hole near connection	CNI	Possible
20G	24	4" concrete	CND	Poor - errosion evident	Cracked pipe	Possible
20H	25	concrete	CND	Poor-errosion evident	Cracked pipe	Possible
20I	25	V.T./concrete	CND	Break in trough	Worn	Possible
20J	76	Covered CNI	CND	Not in use	CNI	CND
20K	76	Covered CNI	CND	Not in use	CNI	CND
21A	22	3" C.I.P.	4" VTP	Spills from CIP-directly to soil	Joints open	Possible
24A	9	None	CND	None	None evident	CND

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5.0 INTERNAL INSPECTION

An internal inspection was made of most of sewer reaches comprising the chemical sewer and its branches. The inspection included first the cleaning of each reach utilizing an hydraulic jet or other appropriate equipment. The subsequent internal inspection of the sewer by a small portable television camera provided a view of the interior of the sewer that was permanently recorded on video tape for future reference and review. Both the cleaning and internal inspection of the sewers was undertaken by Robinson Pipe Cleaning Co., a contractor skilled in this type of work. At several locations in the system, the contractor was unable to televise the sewer due to colapsed pipe, significant blockages or other factors that effected the internal inspection. The length of various size pipe cleaned and inspected is summarized on the Table No. 3, that also includes the length of sewers not televised. Approximately 85 percent of the total system (not including minor connections) was inspected, including the majority of the principal sewer.

Individual field logs or records were prepared for all sewer reaches inspected. The logs identified the location of the sewer, its size, material of construction, length, as well as the location of other pertinent features observed during the video inspection. These features normally include the location of joints, both leaking and non-leaking, circumferencial

TABLE 3

GIVAUDAN CORPORATION

CHEMICAL SEWER DIMENSIONS

(Based Upon Internal Inspection Results)

PIPE SIZE (Dia./Mat.)	SEWERS INSPECTED		SEWERS NOT INSPECTED		% of System
	Reaches	Length (ft)	Reaches	Length (ft)	
24" VTP	4	312	-	-	5.2
18" VTP	15	1286	2	317	26.6
15" VTP	2	185	-	-	3.1
12" VTP	12	1211	-	-	20.1
10" VTP	9	1100	-	-	18.2
8" VTP	10	615	5	419	17.1
6" VTP/CIP	6	425	4	160	9.7
TOTAL	58	5134	11	896	100.0

TOTAL SYSTEM 69 Reaches

6030 LF - Sewer

cracks, longitudinal cracks, broken pipe, building connections, pipe sections out of alignment, open joints, low spots (where water or sediment is trapped) and other visible defects. The equipment utilized permitted a simultaneous vocal interpretation and account of the internal inspection on the video recording tapes. The record included references to length of pipe reviewed (for the accurate location of each condition observed) as well as conditions encountered. As such, internal inspection provided a detailed record of the conditions of the interior of the sewer from manhole to manhole. The video tapes are maintained on file for future reference.

The internal inspection provided detailed information necessary to determine the condition of the pipeline as it may relate to the potential for exfiltration from the sewer. The visual inspection will also be useful in estimating rehabilitation cost for the sewers inspected. The results of the internal inspection have been included in the Appendix of this report both in a summary form as a field log and as a graphical representation, included in this section.

The investigation involved the inspection of over six thousand feet of the chemical sewer and its branches. A summary of the internal inspection, including specific data on the internal condition of the pipeline is shown on Table 4. The location of poorly aligned joints, cracks and all broken pipe was of immediate concern in this project since the potential for exfiltration is high at locations where these defects are found. Plate "A" included in the rear of this report shows the chemical sewer system and identifies (in summary format) the results of the internal inspection and hydrostatic testing described hereafter. A code has been included on the Plate to show reaches where visible defects were found to be significant. In evaluation of the 58 segments of sewer inspected (comprising about 5,134 lineal feet of sewer) it was apparent that the majority of the sewers (over 93%) exhibited some type of defect, while over 25% of the total sewers were found to be in poor condition either as severly eroded pipe or broken pipe.

A direct correlation between the condition of the pipeline and the hydrostatic test results could not be made in many sewers, due to the presence of broken pipe. The evaluation shown on Plate "A" of the condition of the pipeline was based solely upon the visual inspection and not by the hydrostatic test. As such, the viewers experienced opinion of the pipe condition became the basis for the evaluation shown.

TABLE 4

GIVAUDAN CORPORATION
CLIFTON - NEW JERSEY
CHEMICAL SEWER INVESTIGATION
SUMMARY OF INTERNAL INSPECTION

MANHOLE REACH FROM	TO	PIPE DIMENSIONS SIZE (Inches)	LENGTH (Feet)	MATERIAL	DEFECTS OBSERVED JOINTS OUT OF ALIGNMENT (Number)	CRACKED PIPE Location Number	BROKEN PIPE Location Number	DESCRIPTION OF PIPE CONDITION PIPE	JOINTS	OTHER
A. CHEMICAL SEWER										
1	2	18	17	VTP	1	0	0	Good	Misaligned	None
2	Pit 35	18	38	VTP	4	0	0	Good	Misaligned	None
Pit 35	3	18	19	VTP	0	0	0	Good	Misaligned	None
3	4	18	64	VTP	3	0	0	Good	Misaligned	None
Pit 74	6	18	265	VTP	10	3	0	Good	Misaligned	None
9	10	18	141	VTP	1	1	0	Good	Good	Crack @ MH 9
10	11	18	121	VTP	4	3	0	Fair	Good	None
11	12	18	235	VTP	11	2	0	Fair	Misaligned	Break in pipe - deposits
12	13	18	38	VTP	8	1	0	Good	Misaligned	None
13	14	24/21	42	VTP	6	0	0	Good(24")	Misaligned	Poor condition @ 21"
14	15	24	140	VTP	4	0	0	Fair	Fair	Pipe walls are eroded
15	16	24	67	VTP	1	2	1	Good	Fair	Pipe invert cracked
16	17	18	48	VTP	1	0	0	Good	Good	None
17	18	18	122	VTP	3	4	0	Good	Fair	None
18	19	15	82	VTP	14	0	0	Good	Poor	Joints Open

MANHOLE REACH NAME	TO	PIPE DIMENSIONS SIZE (Inches)	LENGTH (Feet)	MATERIAL	DEFECTS OBSERVED JOINTS OUT OF ALIGNMENT (Number)	CRACKED PIPE Location Number	BROKEN PIPE Location Number	DESCRIPTION OF PIPE CONDITION PIPE	JOINTS	OTHER
19	20	10	82	VTP	4	3	0	Good	Good	None
20	21	10	43	VTP	2	3	0	Good	Poor	None
21	22	8	17	VTP	PIPE IS COLLAPSED - INSPECTION NOT POSSIBLE					
22	23	8	250	VTP	27	36	1	Fair	Poor	Pipe is broken
B. BRANCH SEWER (STARTING @ MANHOLE 9)										
9	9-1	12	158	VTP	1	0	1	Good	Misaligned	Broken pipe
9-1	9-2	12	45	VTP	1	2	2	Fair	Open	Broken pipe
9-2	9-3	12	42	VIP	6	2	0	Good	Misaligned	None
9-3	9-4	8	43	VTP	2	0	0	Good	Good	Entire pipe was not inspected
9-3	9-6	8	10	VTP	2	0	0	Good	Open	Entire pipe was not inspected
9-2	9-5	12	74	VTP	4	15	1	Fair	Fair	Pipe broken
C. BRANCH SEWER (STARTING @ MANHOLE 10)										
10	10-1	12	358	VTP	3	3	0	Fair	Fair	Deposits
D. BRANCH SEWER (STARTING @ MANHOLE 11)										
11	11-1	18	78	VTP	6	0	0	Good	Misaligned	None
11-1	11-2	15	103	VTP	7	0	0	Good	Misaligned	None
11-2	11-3	18	26	VTP	6	0	0	Fair	Misaligned	None
11-3	11-4	10	161	VTP	8	1	1	Fair	Misaligned	Broken pipe
11-5	11-6	10	163	VTP	7	2	0	Good	Misaligned	None
11-3	11-5	12	38	VTP	7	0	0	Good	Open	None

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MANHOLE REACH NAME	TO	PIPE DIMENSIONS SIZE (Inches)	LENGTH (Feet)	MATERIAL	DEFECTS OBSERVED JOINTS OUT OF ALIGNMENT (Number)	CRACKED PIPE Location Number	BROKEN PIPE Location Number	DESCRIPTION OF PIPE CONDITION PIPE	JOINTS	OTHER
11-2	11-7	12	232	VTP	13	5	0	Fair	Fair	None
11-7	11-8	18	48	VTP	13	0	1	Fair	Badly Misaligned	Broken pipe
11-8	11-9	10	154	VTP	27	3	0	Good	Misaligned	Deposits
11-7	11-10	12	72	VTP	9	0	0	Good	Misaligned	None
11-10	11-11	12	34	VTP	4	1	0	Fair	Poor	Deposits
11-11	11-12	10	164	VTP	29	9	2	Fair	Poor	Broken pipe
11-11	11-13	18/12	63	VTP	7	3	2	Fair	Poor	Broken pipe
11-13	11-14	10	46	VTP	10	1	0	Fair	Poor	None
11-13	11-15	12	66	VTP	9	4	0	Fair	Poor	None
11-15	11-16	12	22	VTP	4	2	1	Fair	Poor	Broken pipe
11-16	11-18	8	83	VTP	15	5	0	Good	Misaligned	None
E. BRANCH SEWER (STARTING @ MANHOLE 13)										
13	13-1	12	170	VTP	29	2	0	Fair	Misaligned	None
13-2	13-3	18	26	VTP	5	7	2	Fair	Fair	Broken pipe
13-3	13-4	8	57	VTP	6	1	0	Fair	Fair	None
13-4	13-7	8	54	VTP	7	1	0	Good	Fair	Bend in pipe
13-4	13-5	8	14	CIP	0	0	0	Good	Good	None
13-7	13-8	8	25	VTP	2	1	0	Poor	Poor	Poor condition
13-8	13-9	6	36	VTP/CIP	2	2	0	Poor	Poor	Heavy errosion
13-7	13-11	6	216	VTP/CIP	1	2	0	Poor	Poor	Heavy errosion
13-11	13-14	6	52	VTP/CIP	10	4	1	Poor	Poor	Broken pipe
13-11	13-12	6	35	CIP	0	0	0	Poor	Good	None
13-12	13-13	6	27	CIP	0	0	0	Poor	Good	Heavy errosion
13-14	13-15	6	59	VTP	4	5	0	Poor	Poor	Poor condition

932790132

MANHOLE NAME	REACH TO	PIPE DIMENSIONS SIZE (Inches)	LENGTH (Feet)	MATERIAL	DEFECTS OBSERVED JOINTS OUT OF ALIGNMENT (Number)	CRACKED PIPE (Location Number)	BROKEN PIPE (Location Number)	DESCRIPTION OF PIPE CONDITION PIPE	JOINTS	OTHER
F. BRANCH SEWER (STARTING @ MANHOLE 17)										
17	17-1	8	62	VTP	14	1	0	Good	Fair	None
G. BRANCH SEWER (STARTING @ MANHOLE 19)										
19	19-1	10	128	VTP	14	7	2	Fair	Poor	Broken pipe
H. BRANCH SEWER (STARTING @ MANHOLE 20)										
20	20-1	10	159	VTP	7	5	1	Fair	Fair	Broken pipe

SEWERS THAT COULD NOT BE INSPECTED

CHEMICAL SEWER

8	9	-	Sewer Surcharged
23	24	-	Dangerous sewer atmosphere
24	25	-	Dangerous sewer atmosphere

BRANCH SEWERS

11-10	11-19	-	Bend in sewer - equipment could not pass
11-15	11-17	-	Bend in sewer - equipment could not pass
11-16	11-20	-	Could not install equipment through cleanout
13	13-2	-	Significant blockage under building - so prevented inspection & cleaning
13-2	Bldg. 26	-	Bend in sewer - equipment could not pass
13-9	13-10	-	Bend in sewer - equipment could not pass
13-13	13-16	-	Equipment could not be installed in manhole
13-14	13-14A	-	Equipment could not be installed in trough

J10

ANNUAL REPORT

by

Chief Engineer
S. A. LUBETKIN

to the

PASSAIC VALLEY SEWERAGE COMMISSIONERS

FOR THE YEAR

1971

54

932790135

Violations & Eliminations- City of Clifton (continued)

EntinStorm Sewer
Intermittent May 14, 1971 (F. Wendt)

This sewer serves to drain the low lying Entin Industrial tract in Clifton to the Passaic River. Intermittent pollutions from this sewer indicated either an illegal connection from one or more of the industries, or careless housekeeping, wherein industrial wastes are allowed to reach the storm sewer catch basins. On June 28, Mr. Lorenz, wrote to the Greater New York Box Company and the Glamorine Products Corp., informing them of the pollution and requesting that they instruct employees concerning the proper disposal of spilled material and debris. The companies were also directed to clear up a situation where a low section of land collects water creating an unhealthy situation. Since all samples taken since May 14, were satisfactory, this discharge is being removed from the violation list, however, the Commissioners monitor it closely and if any further violations occur the City of Clifton had promised cooperation in prosecuting violators. An up-to-date drawing of the drainage system is being prepared by Clifton to aid in tracing any future "accidents".

Sanitary Sewer Break
August 27 to September 1, 1971 (D. Miele)

The heavy rains, at the end of August, caused a 15" clay sewer under River Road near Third River, to break. Six sections of pipe (total length of 24 ft.) were replaced. Work started at 9:30 A. M. on August 31, and was completed at 12:45 A. M. on September 1, 1971, thus halting the pollution of Third River.

15" Sanitary Line over 3rd. River
September 1-4, 1971 (D. Miele)

A 15" cast iron line carrying sanitary waste under the bridge crossing Third River at River Road, Clifton, started to leak at several joints. The Department of Public Works' crew, headed by Mr. Bush, sealed these joints. The work was completed on Saturday, September 4, 1971, at 5 P.M.

20" Concrete Storm Sewer-Main Ave.,& Route 3.
November, 1971. (F. Wendt)

This storm sewer, located at Main Avenue, north of Route 3, in the rear of the Firehouse, discharged a polluting material into Third River. The pollution generally consisted of high coliform and intermittent high C. O. D. and turbidity. This sewer is actually a State Highway sewer, and has a County Sewer (Main Avenue), connecting to it. The City of Clifton's Sewer Department obtained drawings from the County Engineer's office, PVSC

MEMORANDUM

TO: A. Goldberg, Chief Chemist

FROM: F. Cupo, Supt. II, River Inspection Dept. GIVAUDAN

DATE: 3/17/78

RE: Eroded sanitary line, Clifton

3/15/78 9:10 a.m. sewage odor detected. Upon investigation Inspector Fiore discovered sanitary waste discharging into 3rd River from an eroded 16" Sanitary Line under Passaic County Bridge # 80, River Road, Clifton.

He immediately notified Plant Engineer Bill Sirdan, of Givaudan, Ed Bush, Sewer Foreman, City of Clifton, James Yellen, Assistant Engineer City of Clifton and myself.

At approximately 9:30 a.m. I arrived at site with Inspector Sventy. I met and conferred with Ed Bush and James Yellen, City of Clifton. I was informed Givaudan was responsible for line.

At approximately 10:05 a.m. Superintendent Cupo notified Director of Sanitation Control, A. Goldberg and Bob Reed, Field Supervisor of the N.J. DEP of this pollution violation.

Samples were taken at 10:30 a.m. Robert Kuhn, Assistant Plant Engineer, Givaudan, advised that production in his plant would close down so that temporary repairs to line could be made.

Mr. A. Goldberg, F. D'Ascensio and E. Moller of P.V.S.C. arrived and discussed the problem with Mr. Robert Kuhn, Givaudan Co.

3:15 p.m. The West Orange Contracting Co. 981 Pleasant Valley Way, West Orange, contracted by Givaudan, pumped waste from 16" sanitary line into 8" sanitary line running along Oak Street, Clifton. Two 4" pumps used.

5:15 p.m. sanitary waste flow was haulted. 3 Adams clamps were installed on eroded 16" line. This repair temporary. New 16" plastic lined pipe ordered. Delivery expected in approximately 12 weeks.

8:20 p.m. repairs completed. Pollution eliminated.

3/16/78 - 9:50 a.m. Inspector Fiore made an inspection of repaired line. No leaks detected.

Frank J. Cupo

932790137

to replace old sewer pipe from 1953

DEPARTMENT OF ENVIRONMENTAL PROTECTION
POLLUTION CONTROL MONITORING, SURVEILLANCE AND ENFORCEMENT

REPORT OF PHONE CALL ~~VISIT~~

In ______ Out ______ File Clifton

Date 3-15-78 Time ______ Routing ______

Person Contacted N/A Phone No. ______

Affiliation ______

Subject of Call ~~Visit~~ Sewer line break

Summary of Call ~~Visit~~ 10:59 PVSC called to report a break in the sanitary line going over the 3rd River at River Rd bridge Clifton. Reported to be bad.
11:30 – Frank Cupo called. Reported that the waste coming out of sewer was ~~[illegible]~~ from Givaudan Corp, Delaware Av Clifton. 3 MGD. Frank said the pH was between 4 and 5 when he was there this morning. Wastewater was reddish. Frank said PVSC personnel were going to Givaudan to get them to shut down. Frank said to contact Bob Kuhn (546-8420) at the plant.
11:45 Called Bob Kuhn. He said the PVSC people were there. He had Bill Suydam, Asst Plant Engineer

~~Action Recommended~~ (546-8524) call. Bill had Frank De Sanzio, Alex Goldberg & Ed Malair (PVSC) in the office with him. Bill said the plant was shut down except for cooling water & steam condensate. Shut down began an hour & a half ago. Bill said the line belonged to Clifton. (PVSC letter said it did not belong to (over)

Signature

155

932790138

Givaudan Corp. — Conf. Corresp.

MEMO

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO B. Reed

FROM J. Martusevicn

DATE March 20, 1978

SUBJECT Givaudan Sewer Line Break (1)

On March 8, 1978, Inspector Fiore (P.V.S.C.) discovered a break in a 12 in. concrete lined steel pipe which was located under the River Road Bridge in Clifton. The discharge from the broken pipe was going into the Third River.

Mr. Fiore contacted the City of Clifton and the Givaudan Corporation. The effluent from the pipe had an odor that was characteristic of operations at Givaudan.

P.V.S.C. personnel at the scene took samples of the material being discharged into the stream.

At 11 A.M., Mr. B. Sudyham, Plant Engineer for Givaudan had made arrangements for the Orange contracting company to repair the broken line.

The writer visited the scene at approximately 3 P.M. at which time the contractor had installed portables pumps to by pass the discharge from Givaudan. All operations were shut down at this company with the exception of the power house during this operation.

The repairs were completed by 8 P.M. that evening and operations resumed at the plant.

The writer had some difficulty in obtaining information regarding the effluent of Givaudan. Mr. Broderick, the V.P. of Administration, assured the writer that this information would be sent to this Department. This material has been received.

There does not seem to be any necessity for further involvement.

E106:G25

932790139

PVSC

March 21, 1978

TO: A. Goldberg

FROM: F. P. D'Ascensio

SUBJECT: pH Control System, Givaudan, Clifton

On March 20, 1978, T. Mack and I visited Givaudan in order to review their pH control system. This visit was caused by a failure of a Clifton sanitary sewer line on March 17, 1978. Givaudan is the largest contributor of this line and improper pH control by Givaudan most likely was the major cause of the failure. We were also concerned because Givaudan had replaced this section of line at the end of July, 1977.

A conference was held in John Lampert's office. Also present were George Talarico, Robert Watters and William Suydam. Mr. Watters stated that for about the past two (2) months the use of lime by the pH control system was only half the normal usage. Since manufacturing operations had not been reduced, it appeared that the pH control system was not being run properly. I requested that Givaudan furnish P.V.S.C. with copies of the daily pH recorder charts beginning on March 27th. I also requested that Givaudan examine the entire system and propose a better, more reliable one.

When we inspected the lime station we observed that the pH was three (3) and no lime was entering the sewer line. (The feeder chute was clogged.) The chute was unclogged and the lime began to enter the line. However, there were large swings in pH shown on the recorder chart which indicated that the controller was not operating properly. I informed Mr. Talarico that the instrument would have to be checked.

Finally, we discussed several alternatives, such as using slaked lime instead of powdered lime, installing an equalization tank, changing the pH controller, etc. Givaudan will propose corrective measures and a timetable by April 7, 1978.

Respectfully Submitted,

Frank P. D'Ascensio

Frank P. D'Ascensio

FPD:dhb

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
TRENTON, NEW JERSEY 08625

March 29, 1978

800-705

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. G. Talarico
Director, Regulatory Affairs
Givaudan Corporation
100 Delawanna Avenue
Clifton, New Jersey 07014

Re: Sewer Line Break at River Road
and Third River Bridge
Clifton, New Jersey

Dear Mr. Talarico:

On March 15 and on March 21, 1978 two separate ruptures in the above mentioned sewer line occurred. As a result of this sewer line failure, an as yet undetermined amount of pollutants entired the Third River in violation of N.J.S.A. 58:10A-1 et. seq., N.J.S.A. 58:10-23.11 and N.J.S.A. 23:5-28.

Givaudan Corporation is, therefore, directed to:

(1) Submit to this Department a written report detailing the exact circumstances of each incident. This report should include but not necessarily be limited to the following information; the reasons for the sewer line failures, the quantity of materials discharged to the Third River, the nature of material discharged to the Third River, the interim corrective measures undertaken and the long term solution to this problem. This report shall be submitted within five (5) days of receipt of this letter.

(2) Maintain the pH of the plant discharge to the sanitary sewerage system between the limits 5-9 standard units and provide the Department with records substantiating such control of said discharge.

(3) Inspect the exposed section of the pipe underneath the Third River bridge every four (4) hours daily, including weekends until the new pipe is installed.

The Givaudan Corporation is directed to comply with items (2) and (3) upon receipt of this letter. Immediately after learning that a break has occurred in this line, Givaudan Corporation must notify the office of Hazardous Substance Control (609) 292-5560-Day, (609) 292-7172-Dight, U. S. Spill Notification Center (800) 424-8802 and the Passaic-Hackensack Basin (201) 648-2200 as well as initiate all measures necessary to cease discharging until repairs have been made.

Givaudan Corporation is also requested to provide this office with a statement regarding the ownership of the pipe in which the break occurred.

Any questions you have on the above should be directed to either Mr. G. Martusevich or this writer at (201) 648-2200.

Very truly yours,

Robert J. Reed
Supervisor of Field Operations
Passaic-Hackensack Basin
Water Pollution Control
Monitoring, Surveillance
and Enforcement Element

E106:G19

cc: Mr. C. Snyder, V.P. Manufacturing, Givaudan Corporation
City Engineer, City of Clifton
~~Mr. Frank D'Ascensio~~, Passaic Valley Sewerage Commissioners

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone: (201) 546-8000
Cable. Givaudanco, Clifton
Telex: 138901

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

April 6, 1978

Mr. Robert J. Reed, Supervisor
Field Operations Passaic-Hackensack Basin
Dept. of Environmental Protection
Division of Water Resources
Trenton, New Jersey 08625

Fcc — 711

Re: Your letter dated March 29, 1978 regarding breaks in the sewer line at River Road and Third River Bridge

Dear Mr. Reed:

The exact causes for the failure of the sewer line in question on March 15 and March 21 are not known at this time. Corrosion of the pipe, made of ductile steel lined with cement, could have been accelerated in a number of ways including a defect in the pipe itself or an object striking the pipe when the river was high, knocking the lining off and exposing the metal to attack. We also found that the metering device in our lime house was defective which could have led to some effluent having a lower pH than desired going through the pipe. When we remove the present ductile steel pipe, we may be able to study the problem closer.

The quantity of effluent discharged into the river because of these leaks is extremely difficult to determine; it could have varied from 10 gallons to 100 gallons per hour depending on the flow from the plant. Since we started shut down procedures and bypass pumping soon after the leaks were discovered, the flow through the ruptures was quickly reduced. The nature of the effluent at the time of the breaks is also difficult to determine. We are enclosing a copy of the wastewater analysis taken in 1977, sent to Mr. Martusevich on March 16, 1978.

There are several steps we have taken to eliminate reoccurrence of this problem. Polypropylene pipe has been ordered to replace the pipe presently in use. We have repaired our liming equipment and purchased additional equipment to better control the pH of our effluent.

cc: G. Holtberg

932790143

.../....

GIVAUDAN CORPORATION

Copies of pH charts are sent to Mr. Frank D'Ascensio of PVSC for his perusal on a weekly basis. We have also established daily watch on the sewer line which will now be increased to once every four hours to comply with your request.

We have already sent you some documentation showing that in our opinion the City of Clifton is the owner of the line. Recently obtained sewer maps show that others beside Givaudan use the line.

In terms of long range plans, I repeat what has been told to Mr. Martusevich, Givuadan is ready to move as soon as Federal, State and Local regulation requirements are clearly brought forth.

Very truly yours,

GIVAUDAN CORPORATION

George F Talarico

George F. Talarico
Director, Regulatory Affairs

GFT:brj

Enclosures:

c.c.: Mr. S. Gold, V. P. Operations, Givaudan Corporation
Mr. C. Snyder, V. P. Manufacturing, Givaudan Corporation
Mr. Frank D'Ascensio, Passaic Valley Sewerage Commissioners

CORPORATE ENGINEERING DEPARTMENT

JULY SAMP

ENVIRONMENTAL ANALYSIS LABORATORY

SUBMITTED BY	EXTENSION	BLDG	ANALYSIS NUMBER
R WATTERS	5468530	72	9865

SAMPLE IDENTIFICATION: GIVAUDAN WASTEWATER

CHARGE CODE:

SAMPLING PERIOD:

DATE RECEIVED:

SAFETY HAZARDS: ☐ TOXIC ☐ PATHOGENIC ☐ FLAMMABLE ☐ EXPLOSIVE ☐ LACHRYMATOR ☐ SKIN IRRITANT ☐ UNUSUAL CHEMICAL REACTIVITY ☐ ______

Results are in mg/l unless otherwise specified
ND denotes none detected

> Denotes greater than
< Denotes less than

1.7	☐ pH in pH Units
1730	☐ Acidity to pH 7.0 as $CaCO_3$
	☐ Alkalinity to pH ____ as $CaCO_3$
	☐ Color in Co-Pt Units
	☐ Conductance in μmho/cm
	☐ Turbidity in Jackson Turbidity Units
	☐ Standard Plate Count at ____ °c microorganism count/ml

SOLIDS

2598	☐ Total Dissolved @ 103 °C
	☐ Volatile Dissolved @ 550°C
24	☐ Total Suspended @ 103 °C
	☐ Volatile Suspended @ 550° C
	☐ Total @ ____ °C
	☐ Volatile Total @ 550° C
	☐ Settleable after 2 hours ml/l

OXYGEN DEMAND

Total		Filtered	
185	☐		☐ BOD_5
	☐		☐ BOD_{10}
	☐		☐ BOD_{20}
552	☐		☐ COD

NITROGEN AS N

39	☐ Ammonia
39	☐ Organic
	☐ Total Kjeldahl
26	☐ Nitrate
	☐ Nitrite

CARBON

280	☐ Total
1	☐ Total Inorganic
279	☐ Total Organic

PHOSPHATE AS P

	☐ Total
	☐ Ortho
	☐ Acid Hydrolyzable

ND	☐ Bromide		☐ Cadmium		☐ Palladium
163	☐ Chloride		☐ Calcium		☐ Platinum
	☐ Cyanide	0.096	☐ Chromium		☐ Potassium
	☐ Fluoride	0.212	☐ Copper		☐ Sodium
	☐ Hardness as $CaCO_3$		☐ Iron	0.082	☐ Zinc
	☐ Oil and Grease	0.766	☐ Lead		☐
	☐ Phenolics (4-AAP)		☐ Lithium		☐
561	☐ Sulfate as S		☐ Magnesium		☐
	☐ Sulfide	0.0038	☐ Mercury		☐
	☐ Flash Point °F	0.254	☐ Nickel		☐

REMARKS

☐ ORIGINATOR

[signature] 12/2/77

SIGNATURE FOR LABORATORY DATE

F 3639-3*

932790145

CORPORATE ENGINEERING DEPARTMENT

ENVIRONMENTAL ANALYSIS LABORATORY

SUBMITTED BY	EXTENSION	BLDG.	ANALYSIS NUMBER
R WATTERS	5468530	77	9865

SAMPLE IDENTIFICATION: GIVAUDAN WASTEWATER

CHARGE CODE

SAMPLING PERIOD

DATE RECEIVED

SAFETY HAZARDS				
	☐ TOXIC	☐ FLAMMABLE	☐ LACHRYMATOR	☐ UNUSUAL CHEMICAL REACTIVITY
	☐ PATHOGENIC	☐ EXPLOSIVE	☐ SKIN IRRITANT	☐

Results are in mg/l unless otherwise specified
ND denotes none detected

> Denotes greater than
< Denotes less than

FOR THE DETERMINATION OF	RESULTS
TOLUENE HEPTANE ACETONE MEK METHANOL ISOPROPANOL	NONE DETECTED

REMARKS

COPIES TO ☐ ORIGINATOR

D Marchuk
SIGNATURE FOR LABORATORY

12/2/77
DATE

932790146

GIVAUDAN CORPORATION

125 Delawanna Avenue
Clifton, New Jersey 07014
Phone. (201) 546-8000
Cable. Givaudanco. Clifton
Telex. 136901

May 5, 1978

800-738

Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, N.J. 07105

Attention: Mr. Frank D'Ascensio

Gentlemen:

Replacement of the City of Clifton's Industrial Sewer Line crossing - Third River at River Road, Clifton-Delawanna

In August of 1977, the Givaudan Corporation replaced a leaking V.C. sewer line owned by the City of Clifton which was suspended from Passaic County Bridge No. 80 crossing the Third River. The material used in the replacement line was 16", Class III Ductile Iron. Although the line is actually owned by the City of Clifton it carries domestic sewerage as well as industrial waste. In the interest of expediting the work and in minimizing both the contamination of the river and the inconvenience to Givaudan, we voluntarily replaced the line very expeditiously at our expense.

Due to an embarrassing series of circumstances, the new line was eaten through in eight months resulting in a serious spill into the river on March 15, 1978 and a less serious spill on March 21, 1978. As of April 10, 1978, the line has again been replaced, this time with 16" Schedule 30 steel pipe with a 3/8" thick polypropylene liner. This material should be more permanent. At the same time, we are making repairs and instituting procedures which will insure that our effluent is neutralized more effectively.

While our contractor was working in the river, we had him desnag the area between the dam and the bridge. This work which had been requested by Mr. William Fiore, River Inspector, from the Passaic County Engineers Department, but had never been done was also paid for by Givaudan.

Replacement of the City of Clifton's
Industrial Sewer Line crossing - Third
River at River Road, Clifton-Delawanna

We are proposing two possible alternates aimed at a permanent long term solution to this existing problem:

1) We are requesting that the City of Clifton assist us in obtaining right-of-way so that our effluent need not cross Third River twice on its way to the PVSC main trunk.

2) We are requesting that the County of Passaic allow us to install a spare line under the bridge to be used in the event the lining in the new pipe erodes through.

It is hoped that the quick response and the efforts and expenses incurred by the Givaudan Corporation have minimized any damages to the River and inconveniences to the parties involved.

Sincerely

GIVAUDAN CORPORATION

John C. Lampert

John C. Lampert
Engineering Director

WLS:lk

CC
F. Moller
A. Goldberg

Violation and Elimination - Givaudan Corporation,
100 Delawanna Avenue, Clifton, N. J.

July 14, 1977 (W. Fiore)

On July 18, 1977, while making routine checks on River Road, Clifton, where it crosses Third River, Inspector Fiore observed a white water mark in the street at a storm sewer catch basin. Further investigation revealed what appeared to have been an overflow from a sanitary sewer on the Givaudan property.

When he spoke to Mr. Sirdan, Acting Plant Manager, he was informed that on July 14, at 9:40 A.M. Givaudan found a blockage in their sanitary sewer which caused an overflow,and waste entered Third River from the catch basin. The blockage was cleared by 11:00 A.M. and the overflow ceased. Employees then washed down the residue, which contained lime used in pretreating their sanitary waste. Inspector Fiore informed Mr. Sirdan to notify PVSC any time they have a similar type of problem.

WEEKLY RESUME

10/1/79 to 10/5/79

10/3/79 Fiore
CHEMICAL LEAMAN TANK LINES INC.
80 Doremus Ave.
Newark
Insp.

Special - clogged sanitary overflowed into oil separator - area cleaned - did not reach Passaic River.

10/3/79 Cordasco/Parr
D'ANNUNZIO BROS.
Plainfield Ave.
Scotch Plains

Violation-Elimination - due to heavy rains outlet overflowed into Wigwam Brook - inspite of barricade at outlet.

10/3/79 Mc Laughlin
INMONT CORP.
150 Wagaraw Road
Hawthorne
Called

Special - liquid resin compound spilled during delivery flowed to storm drain thence filter screen bed where it was contained thus preventing entrance to Passaic River -

10/3/79 Cupo/Fiore
O-PAK CORP.
21-24 Mc Carter Hgy.
Newark
Insp.

Special - 20 gallons of diesel fuel spilled from truck due to malfunction of automatic shut off.

10/4/79 Fleming/Perrapato
CITY OF CLIFTON
8" Sanitary line
Crossing by A.D.P.

City making plans to correct this problem - no starting date has been set as of yet

10/4/79 Tomaro/Mc Laughlin
BORO OF HAWTHORNE
Overflows

Special - due to heavy rains opened chamber at 9:30 a.m. and closed 1:30 p.m. same day

10/5/79 Cordasco/Parr
TOWN OF BELLEVILLE
Chestnut St. storm

Sample taken still shows signs of pollution.

10/5/79 Fleming/Perrapato
CITY OF CLIFTON
Athenia Storm

Status quo

10/5/79 Sventy/Cuccinello
TOWN OF GARFIELD
Schroeders Brook

Sample polluting - source under investigation

10/5/79 Fleming/Perrapato
GIVAUDAN
125 Delawana Ave.
Clifton
Cupo

Violation-Elimination- air pocket in sanitary line caused material to bubble up onto road - street area cleaned.

10/5/79 Sventy/Cordasco
HARDMAN INCORP.
600 Cortlandt St.
Belleville
Cupo
Called/Insp

Accidental spill of nonal phenal A.E.P. curing agent from floor drain thence Cortlandt St. - in process of cleaning up.

10/5/79 Tomaro/Mc Laughlin
BORO OF HAWTHORNE
Goffle Brook

Fecal coliform present in samples - source unknown.

DONALD TUCKER
CHAIRMAN
EDMUND LUCHKO
VICE CHAIRMAN

ROBERT M. BURKE, JR
THOMAS J. CIFELLI
DOMINIC W. CUCCINELLO
RONALD W. GIACONIA
JAMES KRONE
FRANK ORECHIO
COMMISSIONERS

Passaic Valley
Sewerage Commissioners

600 WILSON AVENUE
NEWARK, N.J. 07105
(201) 344-1800
Fax: (201) 344-2951

CARMINE T. PERRAPATO
EXECUTIVE DIRECTOR

ROBERT J. DAVENPORT
DEPUTY EXECUTIVE DIRECTOR

GABRIEL M. AMBROSIO
CHIEF COUNSEL

LOUIS LANZILLO
CLERK

February 10, 1992

State of New Jersey
NJDEPE
Office of Enforcement Policy
CN - 029
Trenton, NJ 08625-0029
Attn: Ms. J. Farley

RE: CLEAN WATER ENFORCEMENT ACT ANNUAL REPORT NO. 1

Dear Ms. Farley:

Enclosed are two additional copies of the referenced report which had been inadvertently mailed to the Richard Hughes Justice Complex. While preparing the copies we made a few minor corrections to the dates on form CWEAR-1 and the numbering of SNC users on question 22. Please note that we are unable to determine whether users regulated by 40 CFR 414 (OCPSF) are in compliance because EPA has not yet responded to our request for clarification. Although this report covers a six month period, subsequent reports will cover a full twelve months. We will be happy to discuss the contents of this report, if you have any questions.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

Carmine T. Perrapato
Executive Director

FDA/sml

Enclosures

cc: Robert Davenport, Deputy Executive Director
Frank P. D'Ascensio, Manager, Industrial & Pollution Control

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KLI 005918

Question 22 - cont'd

8. General Color 20401182 24 Avenue B, Newark, NJ 07114

Two serious violations for Zinc for July and August 1991; one serious violation for Cadmium in September 1991. Company is using an additional pH adjustment tank (since October) after their sand filter to try and improve results.

9. Givaudan 03401024 125 Delawanna Avenue, Clifton, NJ 07015

Two serious violations for Petroleum Hydrocarbons, one in October and one in December 1991. A TWA for the upgrading of their Petroleum Hydrocarbons pretreatment system has been approved and it is expected that once operating their problem will be corrected.

10. Kingsland Drum & Barrel 20402840 308 Miller Street, Newark, NJ 07114

Four serious violations for Petroleum Hydrocarbons for July, August, September, and November 1991. PVSC initiated civil suit and the company is under consent order. In October, a study was completed by their consultant Dynatech, and work was started toward achieving compliance, with an upgraded pretreatment system schedule to be on-line by October 1992.

11. Leader Dyeing 27400220 94 Madison Avenue, Paterson, NJ 07509

Two serious violations for Petroleum Hydrocarbons for August and October 1991. Company responded in a December 17, 1991 letter with 4 consecutive samples in compliance.

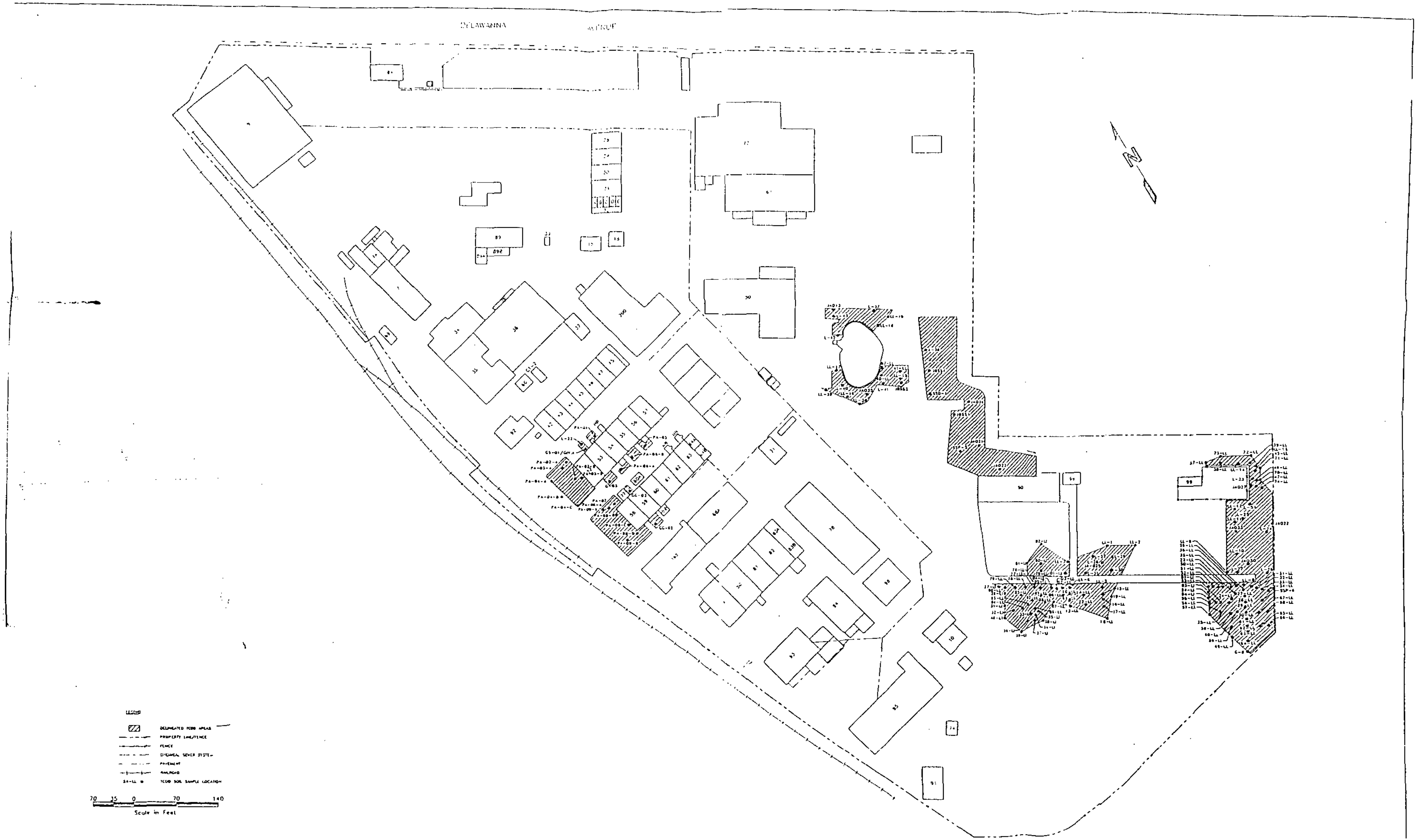
12. Swepco Tube 03401320 1 Clifton Blvd, Clifton, NJ 07015

Three serious violations for Nickel for September, October, and November 1991; three serious violations for Chromium for September, October and November 1991.

13. Whitney Rand 27406692 505 Ellison Place, Paterson ,NJ 07501

Two serious violations for Zinc for August and November 1991. The company's consultant E.C.R.A. has given Whitney Rand a number of items to look into, which may ultimately lead to further pretreatment steps. This was conveyed to Whitney Rand in a letter from E.C.R.A. dated 12/10/91. Also, two discharges from their processes have been eliminated.

J11



Givaudan-Roure Corporation

Clifton New Jersey

Environmental Resources Management, Inc.

ERM

Delineated TCDD Areas and Sample Locations

DRAWING NO. 1

DATE 01.29.92/03.13.92

J12

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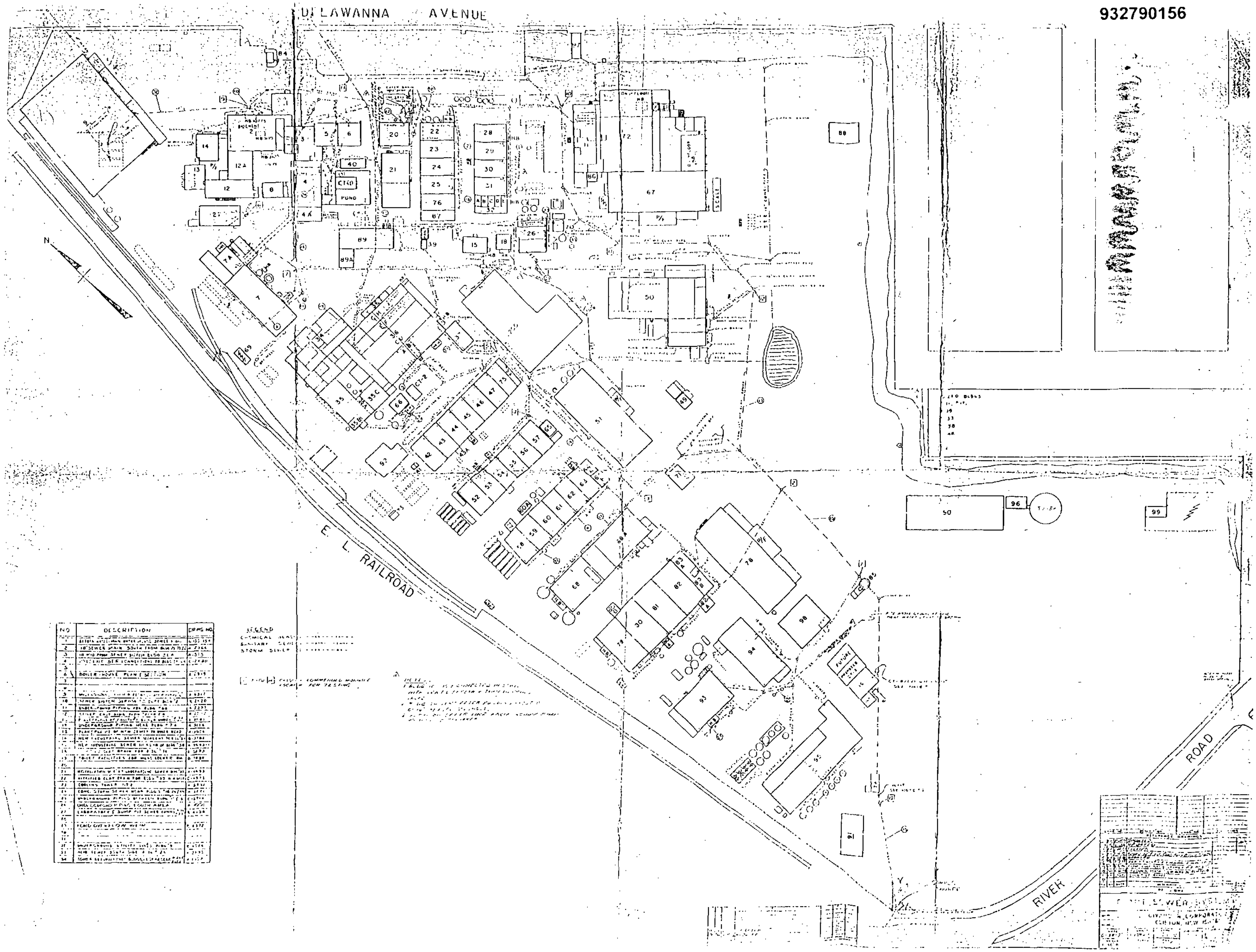
DELAWANNA AVENUE
E L RAILROAD
RIVER
ROAD
N
LEGEND
NO.
DESCRIPTION
DRWG NO.
SCALE

J13

Givaudan-Roure Corporation

Phase III Remedial Investigation for Ground Water Volume I

15 July 1998

Environmental Resources Management
855 Springdale Drive
Exton, Pennsylvania 19341

BBA000054

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Environmental Resources Management (ERM) on behalf of our client, Givaudan-Roure Corporation (Givaudan-Roure), has completed the Phase III Remedial Investigation (Phase III RI) at Givaudan-Roure's 125 Delawanna Avenue, Clifton, New Jersey facility (plant or site). The Phase III RI was completed under an Administrative Consent Order (ACO) executed between Givaudan-Roure (as Givaudan Corporation) and the New Jersey Department of Environmental Protection (Department) in March 1987. As part of the terms of the ACO, Givaudan-Roure was required to implement a Remedial Investigation (RI) and Feasibility Study (FS) for ground water at the site.

In 1988, ERM conducted a remedial investigation consisting of soil and ground water sample collection and analysis. The results of this investigation were presented in a report titled *Remedial Investigation Report,* submitted to the Department in DRAFT form in 1988. Comments to this report were issued by the Department in 1991 and addressed by ERM/Givaudan-Roure. A revised *Remedial Investigation Report* was submitted to the Department in October 1991. As a result of the Department's comments, it was determined that a Phase II RI was necessary to more fully characterize the soil and ground water conditions at the site.

In 1991, ERM prepared a document titled *Phase II Remedial Investigation and Tank Closure Work Plan* (Phase II RI Work Plan) describing the proposed scope of work for the completion of the RI as stipulated in the 1987 ACO. During preparation of the Phase II RI Work Plan, Givaudan-Roure and ERM proposed to integrate the anticipated closure of the underground storage tanks on the site into the Phase II RI. The Department agreed that this approach was appropriate. Due to administrative and technical changes within the Department, revisions were made to the Phase II RI Work Plan in 1992 and 1993. In May 1993, ERM submitted the final revision of the Phase II RI Work Plan to the Department. At this time, Givaudan-Roure and the Department agreed to separate the Phase II RI Work Plan into three focused work elements to allow the Phase II RI to proceed without undue delay. Each stage was completed and the data reviewed prior to implementing subsequent stages. The proposed scope of work for each focused work element was revised based on the findings of the previous investigation stage.

Based on the Phase I, II and III data, the following general conclusions have been developed:

(1) Two aquifers are present beneath the site (unconsolidated overburden and shallow bedrock). Ground water elevations collected during the Phase II RIGW and Phase III RI demonstrate that the ground water flows from northwest to southeast towards the Passaic River, discharging to the Passaic River.

(2) Recharge from the storm water retention pond results in ground water mounding of the shallow water table, yielding a radial flow pattern.

(3) Results from the pump tests performed during the 1988 RI demonstrate the strike parallel preferential flow direction in the Brunswick Formation (Section 4). The effect of the anisotropy of the Brunswick Formation is demonstrated by the cone of depression generated during the pump test, which is oriented along a northeast trending axis.

(4) Ground water modeling predicts that the bedrock aquifer discharges to the River, thus acting as a natural barrier for flow past the River.

(5) Volatile Organic Compounds (VOCs) were found to be the predominant constituents detected in ground water.

- Area A consisting of the old chemical sewer to the southwest of Building 84;
- Area B defined as the area which includes the old chemical sewer near boring WA-07, former Building 22 and 28 rows, and the botanical landfill;
- Area C consisting of the former spent acid pit and storm water retention pond and former maintenance building (Building 50);
- Area D defined as the former railcar off-loading and drum storage area near Building 69; and
- Area E defined to be the area adjacent to Building 82 where an accidental release from process equipment may have occurred.

(6) Semivolatile Organic Compounds (SVOCs) were detected in only 3 of 61 site monitoring wells at concentrations which are marginally greater than the Department's Ground Water Quality Standards (GWQSs). For the purpose of developing a site-wide Remedial Action Plan, SVOCs are not considered to be constituents of concern.

(7) The ubiquitous occurrence of several metals, the detection of metals at similar concentrations in well MW-23S upgradient of production areas, and the low frequency of metals detected above the Residential Direct Contact Soil Cleanup Criteria during the RIS, suggest that with a few exceptions metals detected in ground water are naturally occurring. Additionally, based on the absence of these metals at concentrations exceeding the GWQS in MW-25D, MW-26D, and MW-29D, located hydraulically downgradient of the plant, site-related

metals detected at concentrations exceeding the GWQS are localized and do not impact the Passaic River. For the purpose of developing a site-wide Remedial Action Plan, metals are not considered to be constituents of concern.

(8) No potable water supply wells were identified within a 1-mile radius of the site.

A comprehensive interpretation of the soil and ground water data collected at the site to date identifies five AOCs as potential sources of impacts to ground water:

- Area A defined as the area southwest of Building 84;
- Area B which includes boring B-1, suspected chemical sewer break in vicinity of former Tank 56;
- Area C defined as the spent scid pit/storm water retention pond
- Area D defined as the area in the northwest portion of the plant where toluene was detected in ground water in MW-9S;
- Area E defined as the area in the southwest portion of the plant where toluene was detected in ground water in MW-6S.

Specific conclusion related to each area identified discussed above are summarized below:

Area A

- A release from the old chemical sewer in the area southwest of Building 84 has resulted in impacts to ground water at this location. Primary constituents of concern in this area include toluene and xylenes.
- The data indicate that the lateral extent of the impacted areas in the unsaturated and saturated zones are localized. The vertical extent of impact to soil extends to ground water, thereby acting as a continuing source for impacts to ground water in the downgradient direction.
- The delineation of the source area yielding impacts to ground water in Area is well defined.

Area B

- A release from the old chemical sewer in the vicinity of former Tank T-56 has likely resulted in a continuing source for toluene and xylene to ground water. In addition, available data suggests the potential for impacts from laterals of the old chemical sewer adjacent to the former building rows 22 and 28.

- The former botanical landfill is considered to be a potential source area for organic constituents detected in the ground water.
- Based on ground water modeling, Area B is concluded to be the likely potential source for organic constituents detected in MW-24D.

Area C (Former Spent Acid Pit and Storm Water Retention Pond)

- The low concentrations of 1,2-DCA in ground water and soil indicate that 1,2-DCA was introduced into the ground water in an aqueous solution.
- The large volume of water that infiltrates through the storm water retention pond results in a continuous "flushing" of Area C. Thus, residual 1,2-DCA present in this location has been diluted to trace to very low levels in the immediate area of the historical source.
- Historical disposal of acidic waste in the spent acid pit has caused leaching of naturally occurring metals from the soil and bedrock in the immediate area. This has resulted in coprecipitation and adsorption of metals on iron and manganese-rich sediment as demonstrated by the significant decrease in concentrations of dissolved metals (filtered) compared to total metals (unfiltered). Therefore, only those wells which exceed the Ground Water Quality Standards in the filtered sample have been impacted by the historic operations of the spent acid pit. ?
- The sporadic distribution of impacted wells does not suggest a continuing source which contributes to dissolved metals in ground water. Rather, this distribution suggests a residual effect of the operation of the plant in general.

Area D

- The highest concentration of toluene detected during the Phase III RI was detected adjacent to Building 69 along the western property boundary. This location is consistent with the area where off-loading of railcars and drum storage occurred.
- The lateral extent of the dissolved toluene plume is very narrow and well defined. The length of the plume is not fully defined at this time.
- Based on the concentrations of toluene detected in soil, a definitive source area was not defined. However; toluene was detected in the soil in this area at concentrations of up to 3 mg/Kg. Toluene was not detected in soil samples in any other locations.

Area E

- Toluene detected in ground water in MW-6S and MW-7S is the result of a temporary operational change in Building 82 which resulted in an accidental release to the old chemical sewer or Building 82 sump,
- Hydrogeologic modeling and simple calculations confirm that toluene detected in wells MW-6S and MW-7S are related to the same incident.
- Ground water analytical data indicates the toluene has attenuated rapidly and has not migrated off-site.

Specific conclusions related to the detection of 1,2-DCA in ground water are:

(1) *Historical pumping likely drew high concentration* 1,2-DCA *from the* spent acid pit and/or Area B to plant wells No. 6 and No. 7. Figure 5-4 shows that these areas were within the direct flow path to these pumping wells.

(2) Cessation of pumping in the mid-1980's restored natural flow conditions, and the 1,2-DCA plume from Areas B and C to the production wells began to redistribute downgradient, creating a very wide plume across the eastern/northeastern portions of the plant (Figure 5-6).

(3) Because the active release of 1,2-DCA in solution has ceased over several years the contamination dissipates, leaving ubiquitous, but low level concentrations on-site.

(4) A "slug" from Area B migrated away before biodegradation occurred, and is now present downgradient at MW-24D (Figure 5-6).

The above hypothesis is consistent with all of the site analytical data and also with the ground water flow model.

Based on the above conclusions, the following recommendations are made:

(1) As a preliminary step in developing a site-wide Remedial Action Plan additional investigation of Area B is required. Recently acquired information suggests this area may be a source area for organic constituents detected in MW-24D. In addition, to establish concentration gradients necessary to develop Classification Exception Area boundaries, two additional bedrock monitoring wells will be installed on the north side of Delawanna Avenue. The results of this supplemental investigation will be reported to the Department as soon as possible after the data is collected.

(2) A complete round of ground water samples from all existing and to-be-installed monitoring wells. The samples will be analyzed for VOCs, TAL metals (total and dissolved) and parameters necessary to confirm conditions for intrinsic biodegradation (i.e., degradation compounds). This will provide the necessary data to evaluate natural attenuation as a potential remedial scenario.

(3) A site-wide Remedial Action Plan will be developed to address each impacted area. The Remedial Action Plan shall evaluate appropriate remedial alternatives, including No Further Action, for each area and provide a recommendation of the most appropriate alternative. An integral part of the Remedial Action Plan will be to report the results of the recently completed pilot study performed in Area A for in-situ chemical oxidation and the applicability to other areas of the plant.

(4) As appropriate, applications will be submitted for the dissolved phase plumes identified during the Phase III RI. The applications may include: (1) dissolved phase 1,2-DCA to the east of the plant; and (2) dissolved phase toluene to the west of the plant.

A contaminant fate and transport model will be constructed covering the two CEA areas using the fate and transport model, WinTran®. The fate and transport model will be used to simulate the plume attenuation process and estimate the time required for concentrations at certain locations to decrease below the GWQSs.

For the purpose of developing a site-specific Remedial Action Plan, the technologies to be evaluated will include, but not limited to:

(1) Source removal through excavation and disposal of impacted soils,

(2) Intrinsic biodegradation including natural attenuation and enhanced biodegradation of constituents in ground water,

(3) In situ Chemical Oxidation including oxygen releasing compounds, hydrogen releasing compounds of constituents in ground water,

(4) Air sparging/Soil Vacuum Extraction for treatment of source areas in soil and ground water,

(5) Pump and Treat systems for containment of dissolved phase plumes on the plant for treatment of soil and ground water.

The evaluation of potential alternatives will also include No Further Action based on the site-specific risk to human health and the environment presented by the conditions at the site. A No Further Action recommendation will likely include institutional and engineering controls to assure protection of human health and the environment. The derivation of site-specific remediation objectives will be evaluated as part of the development of the Remedial Action Plan.

The selection of a remedial alternative for the plant will carefully consider the potential future reuse of the plant into the decision making process. The final Remedial Objectives will ultimately be based on the future use of the property.

1.0 INTRODUCTION

Environmental Resources Management (ERM) on behalf of our client, Givaudan-Roure Corporation (Givaudan-Roure), has completed the Phase III Remedial Investigation (Phase III RI) at Givaudan-Roure's 125 Delawanna Avenue, Clifton, New Jersey facility (pant or site). The Phase III RI was completed under an Administrative Consent Order (ACO) executed between Givaudan-Roure (as Givaudan Corporation) and the New Jersey Department of Environmental Protection (Department) in March 1987. As part of the terms of the ACO, Givaudan-Roure was required to implement a Remedial Investigation (RI) and Feasibility Study (FS) for ground water at the site.

In 1988, ERM conducted a remedial investigation consisting of soil and ground water sample collection and analysis. The results of this investigation were presented in a report titled *Remedial Investigation Report*, submitted to the Department in DRAFT form in 1988. Comments to this report were issued by the Department in 1991 and addressed by ERM/Givaudan-Roure. A revised *Remedial Investigation Report* was submitted to the Department in October 1991. As a result of the Department's comments, it was determined that a Phase II RI was necessary to more fully characterize the soil and ground water ground water conditions at the site.

In 1991, ERM prepared a document titled *Phase II Remedial Investigation and Tank Closure Work Plan* (Phase II RI Work Plan) describing the proposed scope of work for the completion of the RI as stipulated in the 1987 ACO. During preparation of the Phase II RI Work Plan, Givaudan-Roure and ERM proposed to integrate the anticipated closure of the underground storage tanks on the site into the Phase II RI. The Department agreed that this approach was appropriate. Due to administrative and technical changes within the Department, revisions were made to the Phase II RI Work Plan in 1992 and 1993. In May 1993, ERM submitted the final revision of the Phase II RI Work Plan to the Department. At this time, Givaudan-Roure and the Department agreed to separate the Phase II RI Work Plan into three focused work elements to allow the Phase II RI to proceed without undue delay. Each stage was completed and the data reviewed prior to implementing subsequent stages. The proposed scope of work for each focused work element was revised based on the findings of the previous investigation stage.

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The three key stages of the RI implementation were:

Stage 1

Stage 1 consisted of the closure of 52 underground storage tanks property by excavation and removal or in-place abandonment and removal of related potential source areas. This activity was completed by Givaudan-Roure between 1993 and 1994.

Stage 2

Stage 2 consisted of the completion of a ground water investigation which included expanding the existing ground water monitoring well network and characterization of potential source areas.

From 1994 to 1996, the installation of 15 ground water monitoring wells was completed to supplement the existing well network. Four inactive production wells were also abandoned during this time period.

Stage 3

Stage 3 consisted of a detailed soil investigation including the identification and characterization of potential source areas.

From February through May 1996, 98 soil borings were installed in areas of concern identified from historical information provided by Givaudan-Roure and analytical results of the previous two stages. Included in this task was the collection of soil samples from each investigation area. As requested by the Department in correspondence to Givaudan-Roure dated 21 October 1996, two additional soil borings were installed along the southern property boundary of the site on 28 October 1996 to complete the delineation of the site perimeter.

Also in October, 1996, three soil borings (PSB-01 through PSB-03) were advanced to the bedrock surface in areas identified as potential sources for continuing impacts to ground water. The locations of these borings were based on a refined understanding of the site hydrogeologic conditions and ground water analytical results obtained during the Phase II RI. The results of these borings were reported in the *Remedial Investigation Report for Soil* (ERM, December 1996) along with the results from Stage 3 soil investigation discussed below.

Results obtained during the closure of the underground storage tanks as described in Stage 1 above were reported in *Underground Storage Tank Closure Report* (ERM, February 1997). The findings of the Phase II

Remedial Investigation for Ground Water (RIGW) described in Stage 2, were reported in *Phase II Remedial Investigation Report for Ground Water* submitted to the Department in March 1997. Data obtained during the soil investigation described in Stage 3 were reported in *Remedial Investigation Report for Soils* submitted to the Department on 5 September 1996 and revised in December 1996. A more detailed summary of these previous investigations is provided in Section 2.

Based on the findings of the Phase II RIGW and discussions with the Department, Givaudan-Roure completed the Phase III RI which expanded the ground water investigation to further define the extent of migration of constituents of concern at the site. The expanded scope of work included installation and analysis of on-site and off-site monitoring wells and collection of in-situ ground water data for source identification and plume delineation.

Phase III RI field activities were completed consistent with the procedures described in the prevailing *Technical Requirements for Site Remediation* (NJAC 7:26E) and *Field Sampling Procedures Manual* (NJDEP, May 1992), and the scope of work described in the following Department-approved documents:

(1) *Phase II Remedial Investigation and Tank Closure Work Plan* (ERM, May 1993);

(2) *Focused Work Plan for Tank Closure Element* (ERM, June, 1994);

(3) *Focused Work Plan for Ground Water Investigation Element* (ERM, October 1994);

(4) *Focused Work Plan for Soil Investigation Element* (ERM, February 1996);

The purpose of this report is to summarize the work completed and provide a detailed description of the investigation methods and analytical results generated during the Phase III RI.

1.1 REMEDIAL INVESTIGATION OBJECTIVES

The primary objectives of the Phase III RI were:

(1) To further evaluate potential source areas, and to the extent possible, assess the potential of previously identified source areas to impact ground water;

(2) To obtain additional information regarding shallow ground water quality in the overburden aquifer as well as to provide a better understanding of site hydrogeologic conditions;

(3) To obtain additional information regarding water quality at the base of the overburden aquifer as well as better position additional wells to provide an improved understanding of site hydrogeologic conditions;

(4) To define the extent of migration of site-related constituents of concern from the site;

(5) To identify potential receptors which may be impacted by constituents of concern which have migrated or may currently be migrating; and

(6) To collect, present, and discuss data necessary to support the development of the Feasibility Study and the selection of a remedial action alternative that will adequately mitigate adverse impacts of the contamination, which may be present, on human health and the environment.

The database generated during the Phase I, Phase II and Phase III RI has achieved these objectives through these key steps: (1) characterization of the nature and extent of constituents of concern in the investigation areas; (2) characterization of the hydrogeological conditions at the site with respect to the migration of constituents of concern; and (3) determination of the extent of any site-related risks to public health and the environment.

1.2 *REPORT ORGANIZATION*

The remainder of this report is divided into 7 sections:

- Section 2 provides a summary of results from previous investigations conducted at the site. Included in this section is a detailed summary of the regional hydrogeology and geology of the area.
- Section 3 provides a description of the scope of work and investigation methods for the Phase III RI.
- Section 4 provides a discussion of the results of the Phase III RI including hydrogeological and analytical data used to develop the site conceptual model.
- Section 5 presents the development of the site conceptual model and discussion of the fate and transport of site related constituents of concern based on the results of the comprehensive ground water investigation.

- Section 6 is a discussion of conclusions derived from the Phase III RIGW analytical data.
- Section 7 provides a discussion of the Remedial Alternative Evaluation to address affected media at the site.
- Section 8 is a NJAC 7:26C-1.2 Certification Statement.
- Section 9 provides a list of references.

2.0 SUMMARY OF BACKGROUND DATA

This section provides a summary of data related to the history of the plant, as well as previous investigations completed by Givaudan-Roure since 1988. Included in this section are brief summaries of previous investigations including brief discussions of analytical results and key conclusions derived from available data.

2.1 SITE DESCRIPTION

2.1.1 Site Location

The site, located at 125 Delawanna Avenue in Clifton, Passaic County, New Jersey is owned and operated by Givaudan-Roure Corporation. It is approximately 31 acres and is occupied by a chemical manufacturing facility (Figure 2-1).

The site is bordered on the northeast by Delawanna Avenue, to the west by New Jersey Transit commuter and freight lines, to the southeast by a small medium-density housing community located on a hill overlooking the site, to the south by small businesses located on River Road, and to the southwest by River Road. The site topography slopes gently from west to east and, in general, the elevation of the property boundary ranges from 1 to 25 feet higher in elevation than the rest of the site.

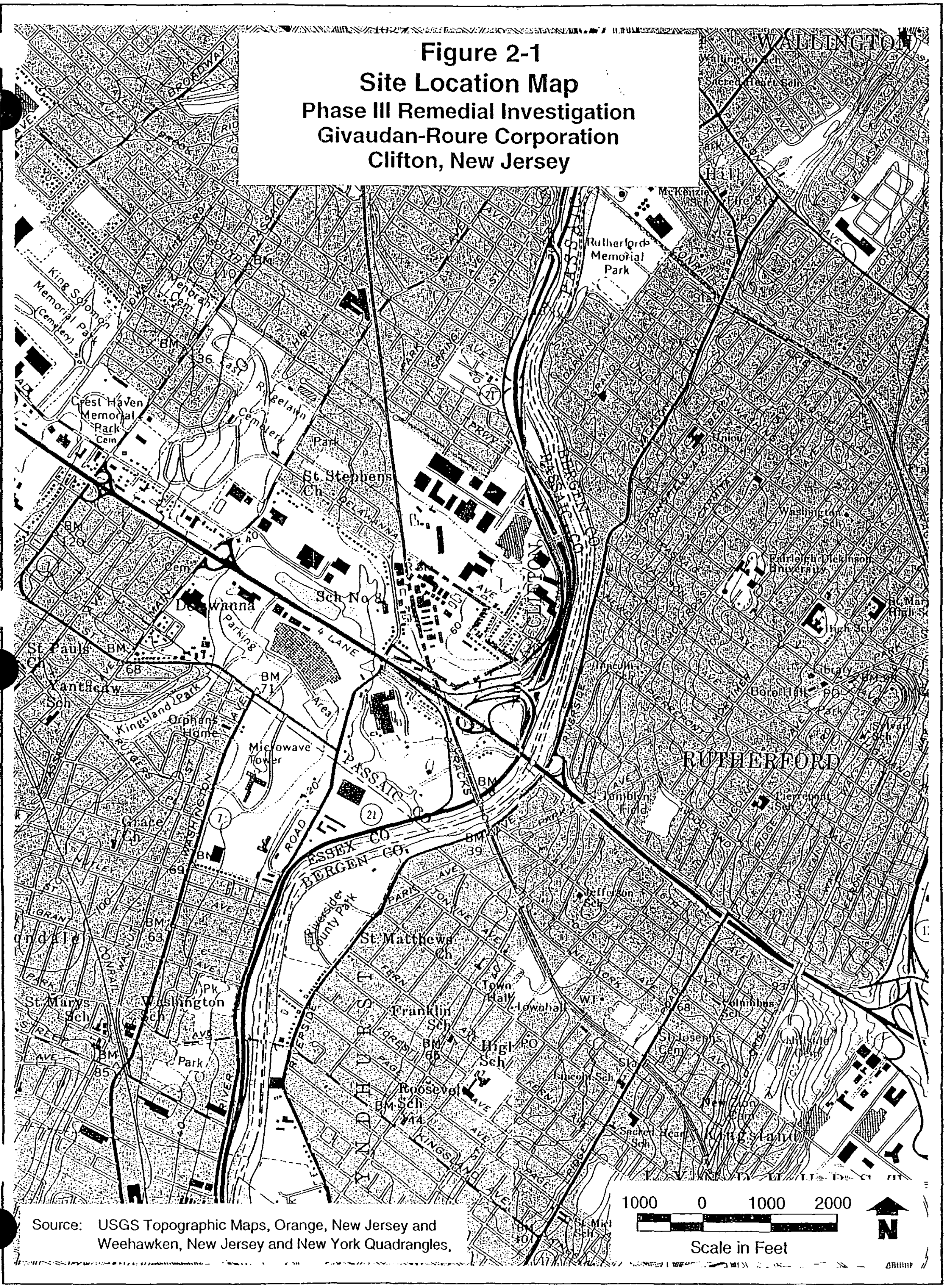
Located across the New Jersey Transit rail line to the west are buildings occupied by light industrial/commercial businesses. The Passaic River, which forms the boundary of Passaic and Bergen Counties, is approximately 0.3 miles to the southeast of the facility and is tidally influenced at this location.

2.1.2 Site History

The site has been an active industrial facility since 1905. The bulk of the original site was owned by Antoine Chiris before its purchase by Givaudan in 1913. Two other portions of the site along the southwest side of the property were owned by National Anode Corporation and Capes-Viscose Corporation. These parcels were purchased by Givaudan in 1926 and 1931, respectively (Figure 2-2).

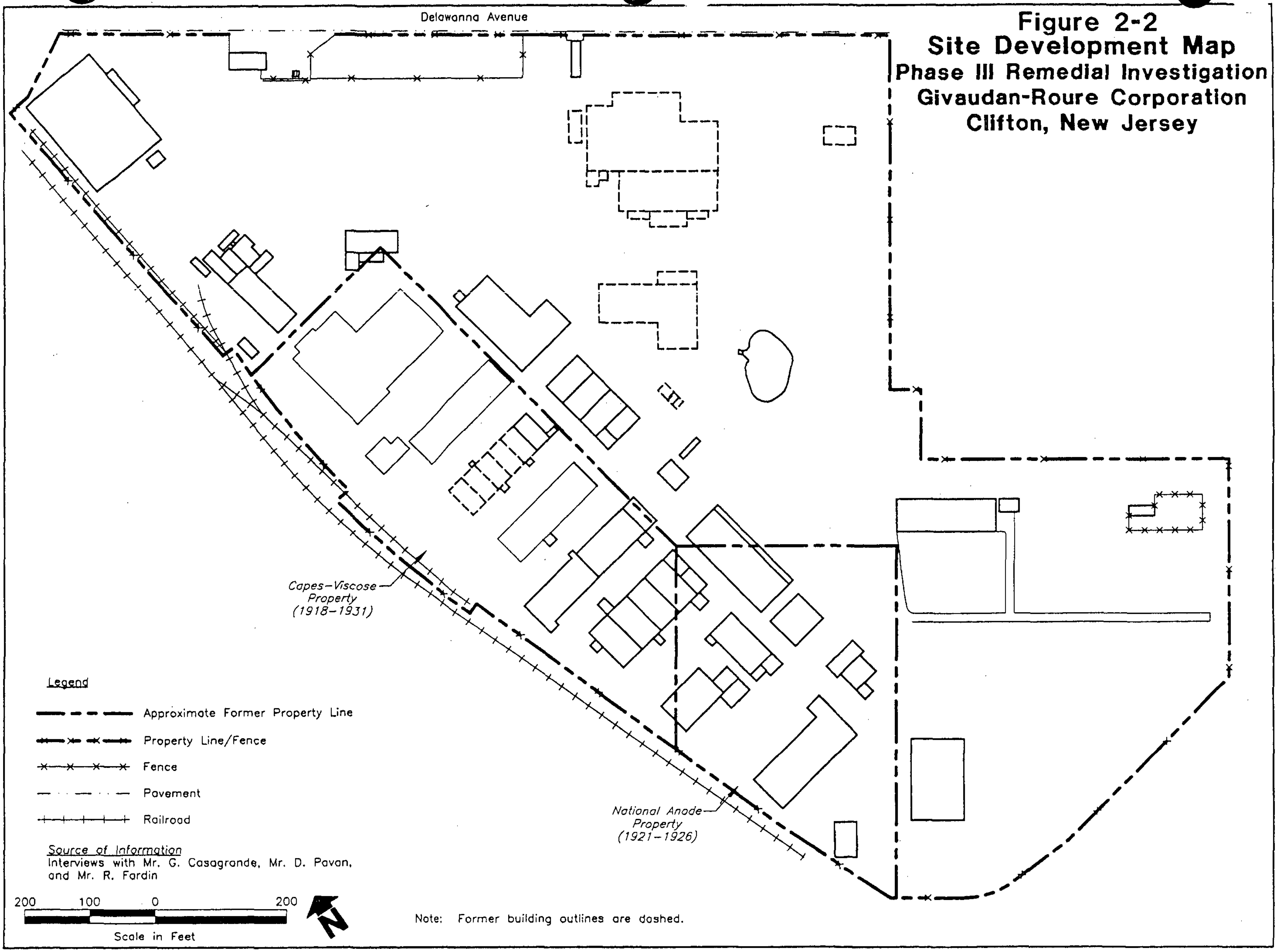
A succession of industries has occupied the property across the railroad tracks adjacent to the west side of the site, including a Minwax

Figure 2-1
Site Location Map
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Source: USGS Topographic Maps, Orange, New Jersey and Weehawken, New Jersey and New York Quadrangles.

ERM



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Corporation plant. During its operation, this facility used a variety of organic and inorganic chemicals, however the waste handling and disposal practices of the operation are unknown. The Minwax plant was closed in 1978 after an explosion and fire at the facility.

The first water supply well was drilled on the site in 1917. Six additional supply wells were drilled on the site by Givaudan and other property owners between 1917 and 1948. The historical locations of these wells are shown on Figure 2-3. A brief description of the well characteristics as reconstructed from site files and conversations with site personnel is presented in Table 2-1.

From approximately 1950 to 1987 ground water was continuously extracted at the site for use as non-contact cooling water. Approximately 1 million gallons per week were extracted, utilized, and discharged to the facilities of the Passaic Valley Sewerage Commission, a publicly owned treatment works.

Continuous renovation of the site occurred up to the present as part of routine improvement and modernization programs. Environmentally related historical improvements included obtaining over 400 permits from the Department for air vents which control process emissions. The original chemical sewer system was replaced in April 1985 with a new state-of-the-art system equipped with secondary containment. The new chemical sewer system consists of a series of pipes constructed within concrete trenches. Gratings over the trenches permit physical inspection for detection of any potential loss of primary or secondary containment. A waste water diversion system responsible for effluent water quality has been in operation for over 20 years. In November 1990 a steam distillation system was installed for the treatment of toluene in waste water. In compliance with the Toxic Catastrophe Prevention Act (TCPA), a facility for storing and handling bromine was constructed in 1990. Finally, between 1993 and 1994, 52 underground storage tanks were removed and/or decommissioned.

The plant was closed at the end of June 1998. At this time, production operations ceased and the plant is currently in the process of being decommissioned.

Figure 2-3
Former Production Well Location Map
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

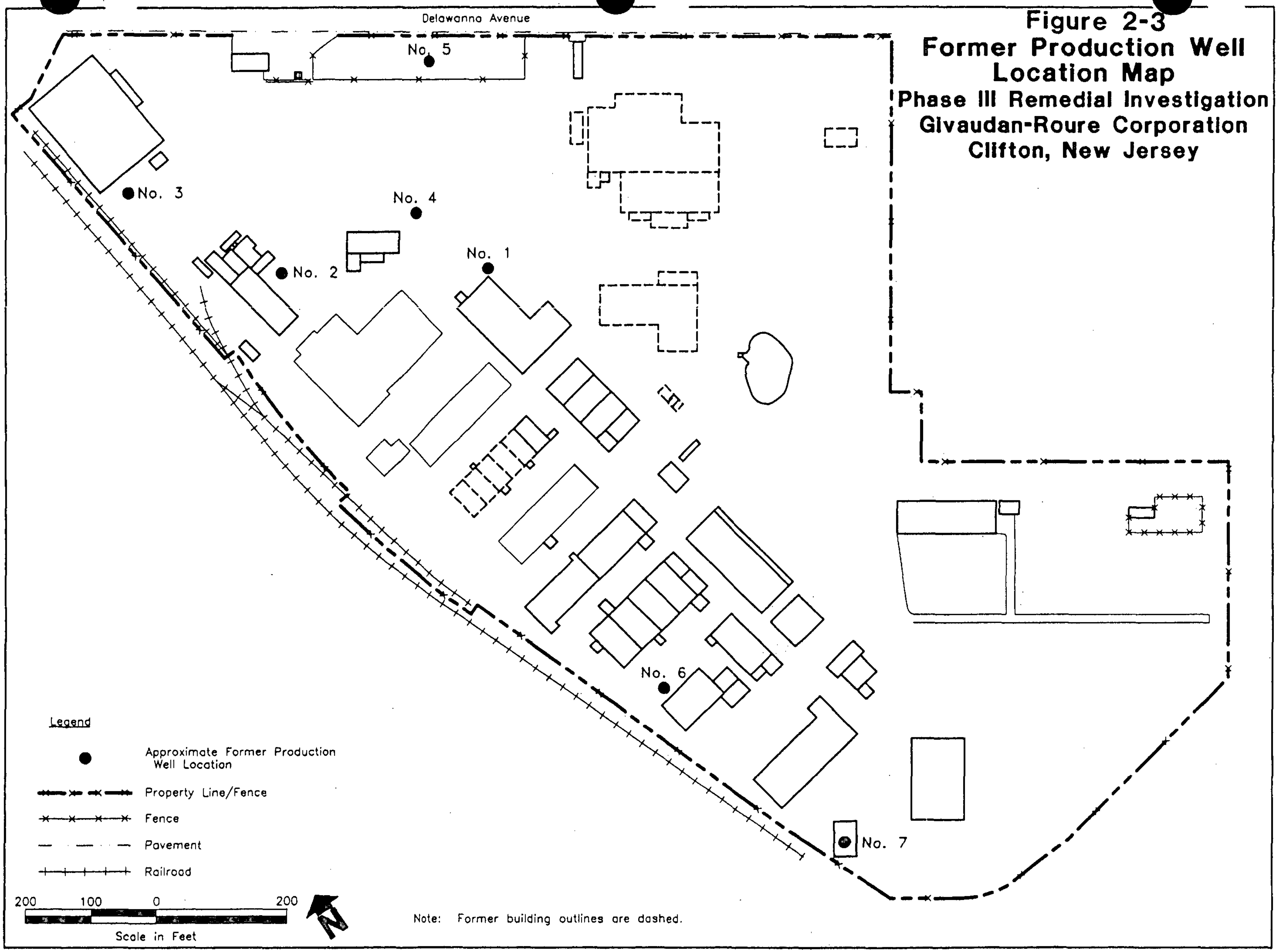

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Table 2-1
Former Production Well Inventory
Phase II Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Well Number	Installation Date	Depth (feet bgs)	Size (inches)	Yield (gpm)	Yield Test Date	Status
No. 1	1926	380	8	20	1943	Inactive, cannot locate
No. 2	1917	501	8	18.4	1931	Abandoned and sealed
No. 3	1922	700	10	22	1943	Abandoned and sealed
No. 4	1928	302	8	35	1935	Abandoned and sealed
No. 5	1928	350 (186.5)	8	23.6	1928	Abandoned and sealed
No. 6	1920	297	6	50 235	1943 1981	Abandoned and sealed
No. 7	1943	250	8	80 100 110 105	1943 1963 1981 1983	Abandoned and sealed

Notes:
- Well No. 5 was originally 350 feet deep but in 1983 as part of reactivating the well, a rubber packer was installed which changed the total depth.
- bgs = below ground surface

2.2 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.2.1 Regional Geology

The unconsolidated overburden of the region consists of Pleistocene Age undifferentiated glacial deposits. The overburden ranges in thickness from 0 to 250 feet and is composed of stratified and unstratified clay, silt, sand, and gravel. A discussion of the physical characteristics of the unconsolidated overburden encountered during subsurface activities is provided in Section 4.

The site is primarily underlain by the Brunswick Formation (also referred to as the Passaic Formation), the youngest lithologic unit of the Late Triassic age Newark Group (Table 2-2 and Figure 2-4) (Carswell and Rooney, 1976). The Newark group is contained in a southwest trending basin that reaches from Rockland County, New York, to northeast Lancaster County, Pennsylvania. The Newark Basin is the largest lobe of three valleys that run in a sinuous belt for more than 1,000 miles from Nova Scotia to South Carolina. These rift valleys formed as a result of normal faulting caused by extensional stress along the Atlantic Coast (King, 1977).

The Newark Group consists of 16,000 to 20,000 feet of non-marine sedimentary rocks and associated intrusive and extrusive igneous rocks deposited in the Triassic rift valleys from Paleozoic source rocks to the northwest. The lowest member of the Newark Group is the Stockton Formation which consists primarily of light yellowish gray to pale reddish brown well-sorted arkose and subordinate conglomerate and mudstone. The Stockton Formation ranges from 6,000 feet thick in the southern portion of the basin (southeastern Pennsylvania) to approximately 1,000 feet thick near the site. The Stockton Formation is conformably overlain by the Lockatong Formation, a large lacustrine lens that ranges from 3,750 feet thick in the center of the basin to 500 to 750 feet thick in the subsurface west of Staten Island, New York. The lowest part of the Lockatong Formation consists of micaceous mudstone with subordinate fine-grained sandstone. The Lockatong grades conformably upward into the Brunswick Formation through a series of gray pyritic shale and mudstone which alternates with analcite and carbonate rich argillite.

The Brunswick Formation consists of a thick sequence of interbedded brown, reddish brown, and gray shale, sandy shale, sandstone, and conglomerate. The thickness of the Brunswick Formation is estimated to range from greater than 16,000 feet in the southwest portion of the basin to several thousand feet in other areas. The lithology of the Brunswick

Table 2-2
Summary of Geology and Hydrogeology of
the Newark Group and Wisconsin Age Glacial Deposits
Phase II Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Group	Age	Formation	Lithologic Description	Water Bearing Characteristics
Undifferentiated Glacial Deposits	Pleistocene Period-Wisconsin Stage	Un-named	Unconsolidated stratified and unstratified clay, silt, sand, and gravel ranging in thickness from 0 to 250 feet.	Poor to very poor water producing zones due to coarse grained units with a high fine grain fraction.
Newark	Late Triassic	Brunswick	Consolidated shales, sandstones, and some conglomerate ranging from several thousand to > 16,000	Generally poor to moderate water bearing capacity but may be extremely high in highly fractured areas.
		Lockatong	Lacustrine deposits of detrital cycles of mudstone and anticline and argillite ranging from 500 to 3750 feet thick.	Unknown in study area.
		Stockton	Well sorted arkose and subordinate conglomerate and mudstone approximately 1000 feet thick near the site.	Unknown in study area.

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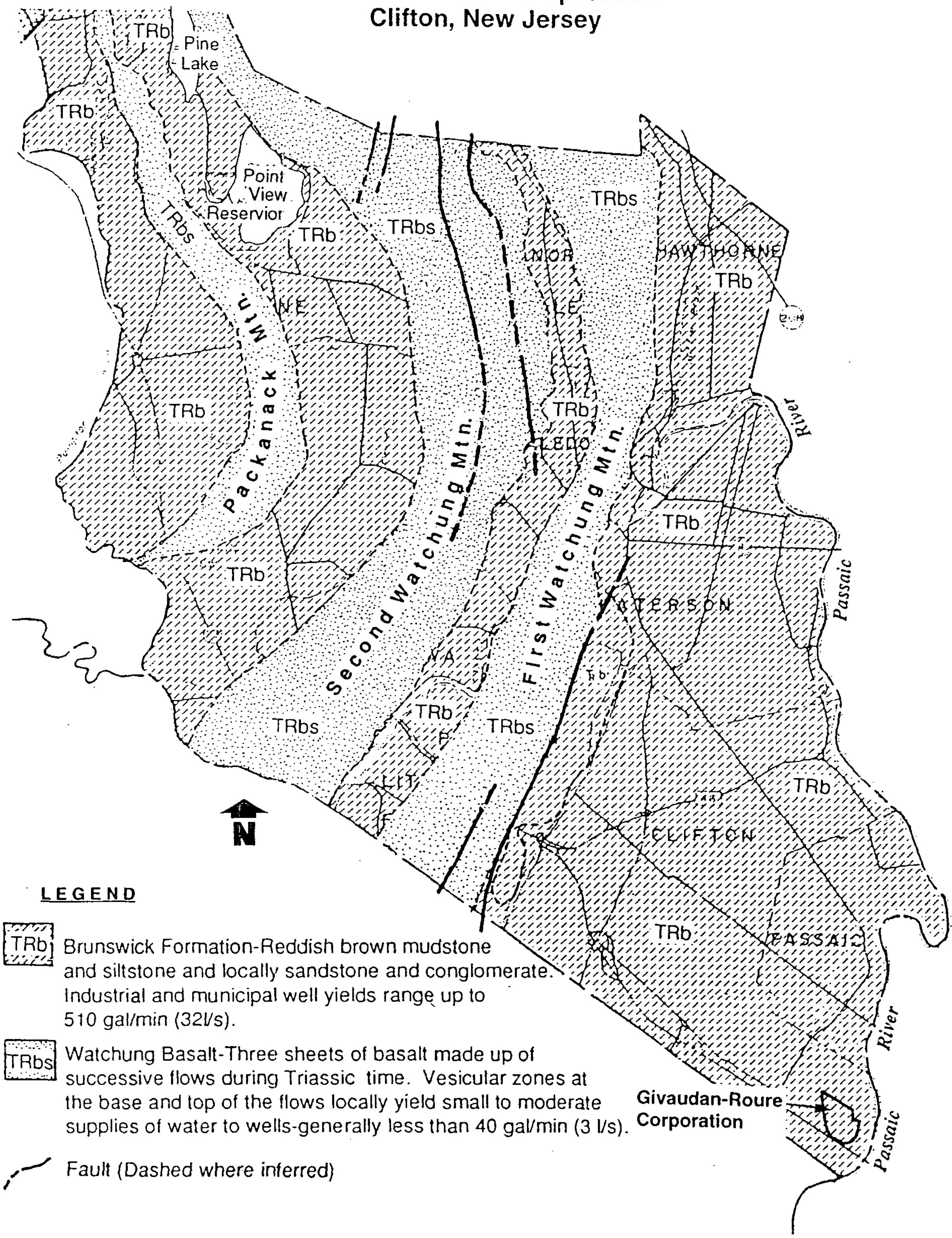
Figure 2-4
Regional Geological Map
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



LEGEND

TRb — Brunswick Formation-Reddish brown mudstone and siltstone and locally sandstone and conglomerate. Industrial and municipal well yields range up to 510 gal/min (32l/s).

TRbs — Watchung Basalt-Three sheets of basalt made up of successive flows during Triassic time. Vesicular zones at the base and top of the flows locally yield small to moderate supplies of water to wells-generally less than 40 gal/min (3 l/s).

Fault (Dashed where inferred)

Scale: 1 0 1 2 3 Miles; 0 1 2 3 4 5 Kilometers

Source: Carswell and Rooney, 1976.

Formation consists primarily of shale and siltstone, but in the northern portion of the basin, it grades into more coarse-grained sandstones and becomes conglomeratic in some areas (Nichols, 1968). The lenticular strata of the formation generally strike north 30 degrees east and dip northwest between 5 and 25 degrees to the northwest.

2.2.2 *Regional Hydrogeology*

Two aquifer systems are present in the region of the site. The unconfined or water table aquifer exists in the unconsolidated sediments of Pleistocene Age related to the Wisconsin Stage glaciation. Confining and semi-confining conditions exist in localized areas where coarse grained lenses are overlain by lake deposits of silt or clay. The consolidated Triassic Age strata of the Brunswick Formation form the bedrock aquifer. The Brunswick Formation is primarily a confined aquifer where covered by unconsolidated glacial deposits (Nichols, 1968). It is composed of a sequence of interbedded relatively thin water bearing units confined by relatively thick aquitards (Michalski, 1990). Aquifer characteristics can vary greatly over distances depending upon the degree of weathering and/or fracturing of the respective water bearing unit.

As a result of the aquifer conditions described above, the transmissivity of the Brunswick Formation is higher primarily along the strike of bedding (Vecchioli, et al., 1969). High angle vertical joint sets have been observed in the Brunswick Formation which contribute to vertical communication between water bearing zones but do not constitute a large impact on preferential ground water flow (Michalski, 1990). However, linear fracture zones can create ground water flow pathways in directions other than strike-parallel. Thus, flow is highly anisotropic in the direction of strike and also, on a local scale, in the direction of fracturing. Vertical communication between separate water bearing units is primarily determined by differences in hydraulic head and the degree of fracturing of the intermediate aquitard.

Saltwater intrusion of the Brunswick Formation occurs near Newark Bay and up the Passaic River valley (Nichols, 1968). Tidal cycles can be observed in the bedrock aquifer near where the Passaic River is tidally influenced. In general, the quality of water in the Brunswick Formation is best near recharge areas in higher altitudes and poor in discharge areas (Carswell and Rooney, 1976).

The water-bearing units present in the unconsolidated sediments of the region occur as sand and gravel layers in the stratified drift along stream valleys. Unconfined sand and gravel deposits are recharged by precipitation directly at the outcrop area. Flow regimes are on a local scale and discharge is to local surface water bodies. Generally, these sand and gravel deposits are less than 20 feet thick and do not yield large quantities of water. The confined and semi-confined unconsolidated aquifers primarily occur in the buried valley deposits and are covered by silts and clays. They are recharged by leakage through the overlying confining beds and by precipitation in any distant outcrop areas. The confined and semi-confined overburden aquifers may also be recharged from the underlying Brunswick Formation. The hydrogeologic properties of the unconsolidated sediments of the region are highly variable, depending upon the amount of fine-grained material in each aquifer. The depth to water in the region ranges from 30 to 40 feet below grade, but may be significantly deeper in areas where long-term pumping is in effect (Nichols. 1968).

Water from the stratified drift deposits ranges in hardness from 65 mg/L to 83 mg/L. Sulfate concentrations are commonly 40 mg/L or less, chloride concentrations are typically less than 11 mg/L and nitrite concentrations are generally around 3 mg/L or less. Elevated sulfate concentrations exist in localized areas and are probably the result of inefficient sewage systems and industrialization (Nichols, 1968).

2.3 *PREVIOUS INVESTIGATIONS*

Previous investigations at the site have included a series of soil and ground water investigations completed at selected locations. Since 1988, three significant investigations have been completed at the site. For the purpose of discussion, these investigations have been characterized under the following headings: (1) 2,3,7,8-TCDD Remedial Investigation; (2) Waste Water Treatment Plant Investigation; and (3) Remedial Investigation. A brief summary of the results of significant investigations is provided below.

2.3.1 *2,37,8-TCDD Remedial Investigation*

Between 1988 and 1989, ERM, at the request of Givaudan-Roure, conducted field investigations at the site to delineate the presence and extent of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). These investigations were required as partial fulfillment of the directives set forth in the 5 March 1987 Administrative Consent Order for 2,3,7,8-TCDD. The investigations included soil borings and collection of soil samples in areas of potential concern.

At the conclusion of the TCDD RI activities, ERM prepared a report titled *NJDEP Approved TCDD Investigation Report and Limited Investigation Report* which was submitted to the Department in January 1991. Figure 2-5 shows the delineated 2,3,7,8-TCDD impacted areas determined from the above described investigation. The investigation concluded that soils impacted by 2,3,7,8-TCDD were confined to the upper 24 inches of the soil profile.

After completing the DRAFT TCDD Investigation Report, ERM completed a Focused Feasibility Study to recommend a remedial action alternative that would adequately mitigate the adverse effects of the 2,3,7,8-TCDD-impacted soils on human health and the environment. The results of the Focused Feasibility Study were reported in the document titled *Delawanna Avenue Facility DRAFT TCDD Feasibility Study* submitted to the Department in April 1992.

In this report, Givaudan-Roure and ERM concluded that the most appropriate remedial alternative was consolidation and on-site containment of the 2,3,7,8-TCDD-impacted soils.

2.3.2 *Waste Water Treatment Plant Investigation*

In August 1991, ERM conducted a limited soil investigation in the area of the proposed waste water treatment plant. The purpose of this limited investigation was to characterize the soil quality in the proposed pad area prior to construction.

The limited scope of work consisted of three soil borings installed to depths ranging from 26 to 29 feet below grade. Soil samples were collected from selected intervals and analyzed for Target Compound List (TCL) Volatile organic Compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) metals. The soil samples were screened in the field using an organic vapor analyzer equipped with a flame ionization detector.

Results of the headspace screening ranged from 2 parts per million (ppm) to 25 ppm at a depth approximately 9 feet below ground surface. Analytical results revealed that only polynuclear aromatic hydrocarbons (PAHs) and one pesticide (aldrin) exceeded the Department's Soil Cleanup Criteria which were valid at the time of the investigation. A detailed discussion of the results of the limited soil investigation was provided in a letter report prepared by ERM for Givaudan-Roure and submitted to the Department on 12 November 1991.

In correspondence to Givaudan-Roure dated 17 January 1992, the Department provided approval of the 12 November 1991 report and released the proposed construction area from further investigation.

2.3.3 *Remedial Investigation*

As discussed in Section 1, an ACO for investigation ground water was executed between Givaudan-Roure (as Givaudan Corporation), and the Department in March 1987 requiring a Remedial Investigation (RI) and Feasibility Study (FS) for ground water at the site.

The Remedial Investigation stipulated by the 1987 ACO was implemented in a series of focused investigations. A summary of these investigations is provided in the following sections.

2.3.3.1 *1988 Remedial Investigation*

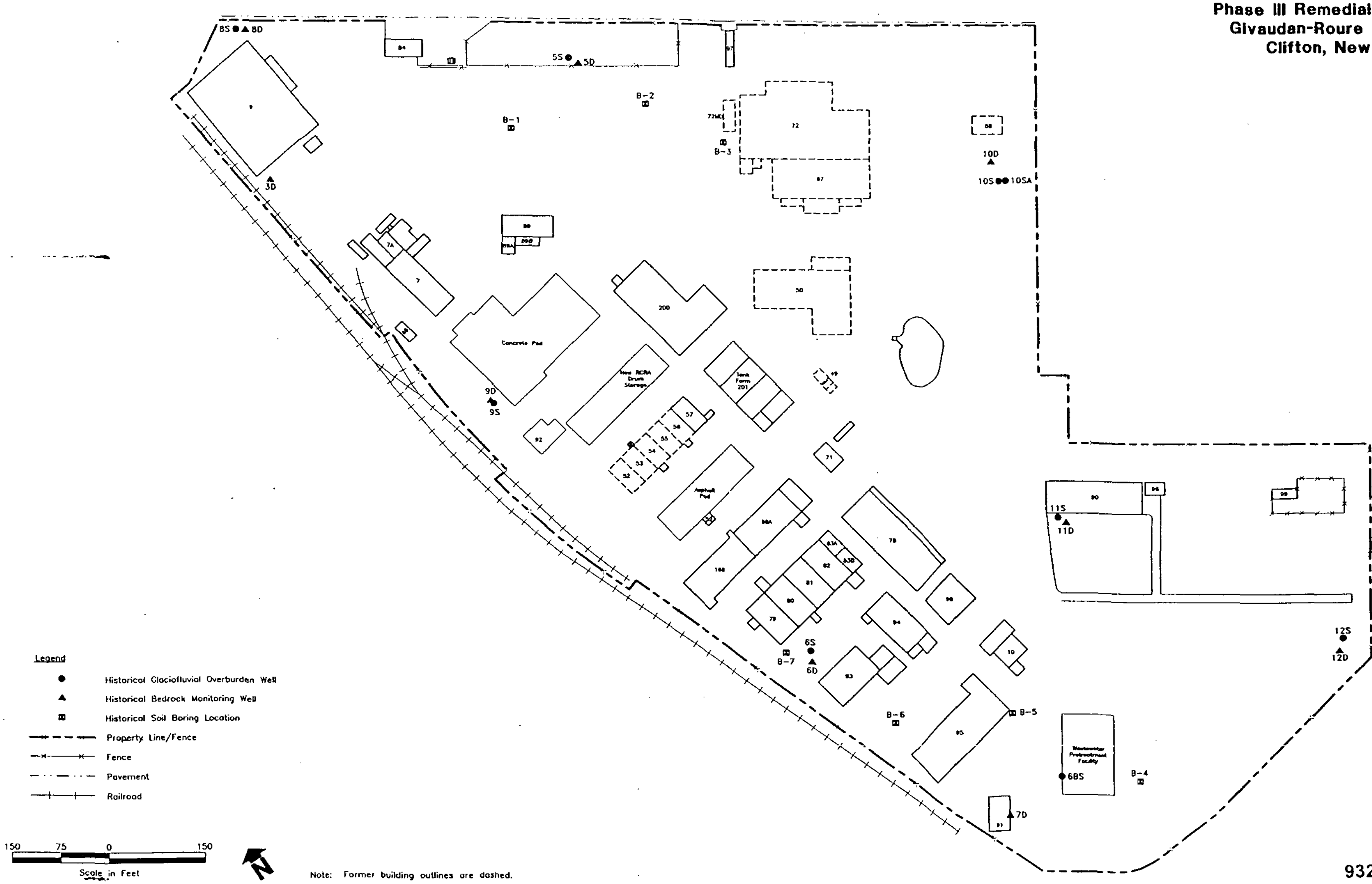
In 1988, ERM conducted a remedial investigation to characterize the soil and ground water quality at the site. The scope of work completed during the 1988 RI included the following tasks:

- A soil gas survey was conducted to identify potential areas of concern where volatile organic compounds (VOCs) may have been present in soils. A second objective of the soil gas survey was to assess the potential presence of constituents of concern in the underlying aquifer.
- Soil samples for chemical analysis were collected from seven soil borings. The location of the soil borings were determined based on the results of the soil gas survey.
- Five deep and eight shallow monitoring wells were installed to supplement existing water quality data obtained from four deep wells on the site.

At the conclusion of the 1988 RI activities, ERM prepared a report titled *DRAFT Remedial Investigation Report* which was submitted to the Department in October 1988 and revised following Department comments in September 1991. This report discussed in detail the investigation methods, analytical methods, investigation results, and conclusions derived from the available data. Also included in this report were brief summaries of investigations at the site related directly to the soil and ground water investigation. The locations of borings and monitoring wells installed during the 1988 RI are provided in Figure 2-6.

Based on the results of the 1988 RI, ERM and Givaudan-Roure concluded that additional data were required to more completely characterize the

Figure 2-6
Phase I Sample Locations
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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extent of constituents of concern detected in soil and ground water at the site.

2.3.3.2 *Underground Storage Tanks*

This section provides a summary discussion of the scope of work and results of the underground storage tank closure activities completed by Givaudan-Roure during the period 1993 through 1994.

Fifty-two underground storage tanks formerly present at the facility were closed at the site starting in 1993 (Figure 2-7) shows the location of the underground storage tanks on the site before closure activities were started in 1993. Closure of the underground storage tanks was completed in two phases: Phase I was completed in 1993 and consisted of the closure of 11 tanks. In 1994, the remaining 41 tanks were closed. The following sections provide a brief summary of the tank closure activities.

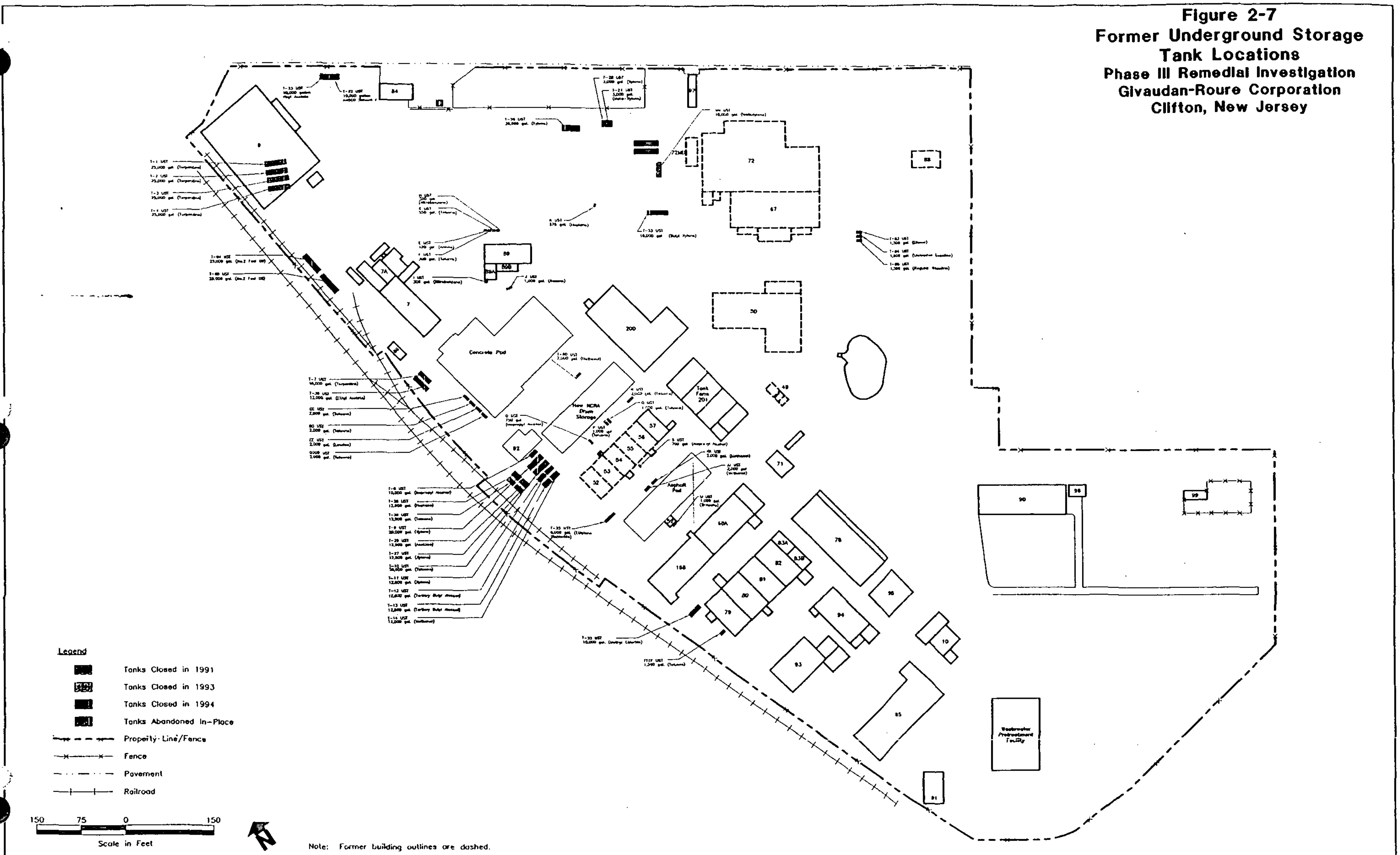
Based on the observations made during tank closure activities and the soil analytical results, ERM and Givaudan-Roure concluded that the underground storage tanks decommissioned under the 28 April 1993 Tank Closure Plan did not adversely impact the soil profile adjacent to each tank location. A detailed discussion of the closure methods and results was provided in the document titled *Underground Storage Tank Closure Report* prepared by ERM and submitted to the Department in May 1994. The Department approved this document in September 1994 in correspondence to Givaudan-Roure dated 19 September 1994.

During the 1994 tank closure activities, several areas requiring further investigation were identified. The excavations in which VOCs were detected at concentrations exceeding the more stringent of the Residential Direct Contact Soil Cleanup Criteria (RDCSCC) and Impact to Ground Water Soil Cleanup Criteria (IGWSCC) were:

- Tank T-56 (total xylenes, toluene, VOC TICs);
- Tanks T-26/T-27 and 28/T-29 (1,2-dichloroethane); and,
- Tank T-24 (1,1,2,2-tetrachloroethane).

The origin of the impacts to soils in the excavation for Tank 56 is not defined. The observation of a break in the chemical sewer system adjacent to Tank 56 suggests that the impacted soils in the excavation may be related to the chemical sewer. This is further supported by the type and profile of the constituents detected in the soil. The constituents detected and their respective concentrations are nearly identical to those detected adjacent to the old chemical sewer in an area southwest of Building 84 (to be discussed in later sections).

Figure 2-7
Former Underground Storage Tank Locations
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Note: Former building outlines are dashed.

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The detection of 1,2-dichloroethane (1,2-DCA) in the excavation for Tanks T-26/T-27 and T-28/T-29 is not consistent with the former contents of these tanks. Additionally, no soil staining was observed in the excavation for these tanks. This suggests that the detection of 1,2-DCA in this excavation is not a result of the historical operation of the tanks.

The detection of 1,1,2,2-tetrachloroethane in the excavation for Tank T-24 is not consistent with the former contents of the tank. This suggests that the detection of 1,1,2,2-tetrachloroethane in the excavation for T-24 is not a result of the historical operation of the tank.

The areas of concern described above were further evaluated as potential areas of concern during the Remedial Investigation for Soils (RIS). The results from the RIS are discussed below.

A detailed discussion of the closure methods and results was provided in the document titled *Revised Final Underground Storage Tank Closure Report* prepared by ERM and submitted to the Department in August 1995. The Department approved this document in correspondence to Givaudan-Roure dated 29 December 1995.

2.3.3.3 *Remedial Investigation for Soils*

Over two hundred soil samples were collected from 100 soil borings advanced in areas designed to investigated the potential impact of historical activities in their respective locations.

Based on the analytical data collected during the RIS, the following general conclusions were derived:

(1) Visual indications of impacted soils were generally not observed in the unsaturated zone. In several of the borings which were extended to ground water, visually affected soils were detected in across a depth interval which extended from several feet above the capillary fringe to the ground water table. Based on the observed depth of visually affected soils and the absence of vertically continuous visually affected soils in the unsaturated zone, it is likely that these soils have been impacted by ground water containing constituents of concern rather than vertical migration from a source in the unsaturated zone. The vertical interval in which the visually affected soils are present may be directly related to historical fluctuations in the water table and the effect of capillary rise in the soil in contact with ground water.

(2) Free phase liquids were not observed during the soil investigation. Furthermore, concentrations of constituents of concern detected were less than guidelines typically used as an indication of the presence of

free phase liquids (1% of the total soil volume, equivalent to 10,000 mg/Kg).

(3) Analytical results obtained during the 1988 Phase I RI and 1993/1994 Tank Closure Investigations identified four AOCs for organic constituents in soil. These areas were: Tank T-25, Tanks T-26/27 and T-28/29, the old chemical sewer near boring WA-07, and soil boring B-1 (1988 RI), located adjacent to the former Building 20 row.

(4) Analytical results obtained during the RIS served to further characterize and delineate these AOCs as well as identify and delineate two additional AOCs (old chemical sewer near Building 84, and the former "Spent Acid Pit") for organic constituents.

(5) In 1988, toluene was detected in the ground water in monitoring well MW-9S. Headspace readings measured using an organic vapor analyzer during the installation of monitoring well MW-9S increased with depth and the maximum reading was observed directly above the inferred water table. No evidence of impact to soil was observed during the excavation of underground storage tanks in this area in 1994, therefore it is ERM's conclusion that the underground storage tanks in this area are not a source for toluene detected in ground water, however, the concentration of toluene detected in MW-9S indicated that a source area for impact to ground water may exist in this area. The detection of toluene in MW-9S was further investigated during the Phase III RI. A discussion of the investigation methods and results of the Phase III investigation of the toluene detected in well MW-9S is presented in Sections 3 and 4.

A comparison of the analytical results derived from the investigations completed up to and including the RIS to the appropriate Department regulatory guidance (Ground Water Quality Criteria and Soil Cleanup Criteria) confirmed the presence of seven AOCs for organic constituents. These areas were:

- soil boring B-1 (1988 RI),
- toluene in ground water in MW-9S,
- Tank T-25,
- Tanks T-26/27 and T-28/29,
- the old chemical sewer near Building 84,
- the old chemical sewer near boring WA-07,
- the former spent acid pit and storm water retention pond.

Data provided in this report and analytical data collected during the comprehensive remedial investigations demonstrate that the surface and subsurface soils in the interior, and along the perimeter of the property have been delineated. The entire eastern property boundary of the site is located on top of a steep incline approximately 25 feet higher in elevation than the rest of the plant. Therefore, soil borings could not be drilled at the property boundary. However, constituents of concern were not detected above the more stringent of the RDCSCC or IGWSCC in the Department-approved borings completed between operations areas and the property boundary. Additionally, soil gas survey results obtained from sampling points collected from the site perimeter during the Phase I RI did not indicate the presence of VOCs. Based on the topography of the site, and the analytical data generated during the RIS, it was concluded that there has been no off-site migration of constituents of concern in soil.

The results of the RIS were reported in *Remedial Investigation Report for Soils* submitted to the Department in December 1996. Approval of the *Remedial Investigation Report for Soils* was provided by the Department in correspondence to Givaudan-Roure dated 27 March 1998.

2.3.3.4 *Phase II Remedial Investigation for Ground Water*

The primary objective of the Phase II RI was to evaluate each of the AOC's confirmed to exist during the RIS. A detailed discussion of investigation methods, and analytical data collected during the Phase II RIGW were reported in *Phase II Remedial Investigation for Ground Water* submitted to the Department in March 1997. The following section provides a brief summary of the significant conclusions derived from the Phase II RIGW:

(1) Based on the Phase II and historical analytical results, VOCs were found to be the predominant constituents detected in ground water. Metals were also detected at concentrations exceeding the GWQS.

(2) Soil samples collected during the Phase I and Phase II Investigation did not detect 1,2-DCA at concentrations exceeding the IGWSCC. Additionally, the highest concentration of 1,2-DCA detected in soil (440 μg/Kg) is less than half of the IGWSCC. The locations of the samples in which 1,2-DCA was detected in soil and the distribution of 1,2-DCA in ground water with respect to the relationship between bedrock geology and the conceptual flow model suggest the former Spent Acid Pit as the location of a historical 1,2-DCA source. Based on the absence of a detectable free phase plume and defined source areas, it was concluded that the presence of 1,2-DCA in the ground water was introduced into the ground water in an aqueous solution. This finding is very significant in consideration of future remedial

alternatives since ground water impacted by dissolved phase VOCs cannot hydrogeologically extend beyond the Passaic River.

(3) Based on the results obtained from ground water elevation measurements and the regional ground water flow modeling, ground water is interpreted to discharge to the Passaic River. Thus, the Passaic River functions as a natural barrier for ground water migration.

Analytical results collected during the Phase II RIGW indicate that two areas of concern identified during the Phase I and/or Phase II RIS may be removed from further consideration: (1) Tank 24, and (2) Tanks T-26/27 and T-28/29.

2.3.4 *Summary of Areas of Concern*

Based on a comprehensive interpretation of the soil and ground water data collected at the site to date, there are five AOCs identified as potential sources of impacts to ground water:

- Area A defined as the area southwest of Building 84;
- Area B which includes boring B-1, suspected chemical sewer break in vicinity of former Tank 56;
- Area C defined as the spent scid pit/storm water retention pond
- Area D defined as the area in the northwest portion of the plant where toluene was detected in ground water in MW-9S;
- Area E defined as the area in the southwest portion of the plant where toluene was detected in ground water in MW-6S.

2.4 *ADDITIONAL DATA REQUIREMENTS*

Based on the results of the Phase II RIGW, ERM and Givaudan-Roure identified several areas that required additional investigation as part of the Phase III RI. These additional data needs are the basis for the Phase III RI discussed in later sections:

(1) Collect additional ground water analytical data to the northeast, east and southeast of the site to assess off-site, downgradient ground water quality. These data will be used in conjunction with on-site data to develop a ground water model to determine the off-site 1,2-DCA plume boundaries (Classification Exception Area).

(2) Installation of an overburden well to the east of the well nest 5 area to monitor potential off-site migration from this area of concern.

(3) Collect additional ground water analytical data to the north, west, and southwest of well nest 9 to identify a potential source for toluene detected in MW-9S.

(4) Collect additional ground water analytical data to the north, west, and southwest of MW-6S to identify a potential source for toluene detected in MW-6S.

(5) Collect background ground water quality data from the overburden aquifer to assess the impact of site-related inorganic constituents on off-site water quality.

(6) Collect additional data on bedrock topography to further define the observed depression in bedrock topography on the eastern portion of the site.

The scope of work for the Phase III RI was developed to address these data requirements. The investigation methods, and results obtained from the Phase III RI are discussed in the following sections.

4.0 PHASE III REMEDIAL INVESTIGATION RESULTS

This section provides a detailed discussion of the results obtained from the Phase III RI.

4.1 WELL SURVEY

The data obtained from the February 1998 well survey shows six 100,000 gpd or greater ground water withdrawal points within a 1-mile radius of the site. Of the these withdrawal points, four are owned by Sandy Alexander Incorporated, and are reported to be 400 feet deep. These four wells are located to the north of the site and have reported capacities up to 150 gallons per minute (gpm). The other two wells are owned by Falstrom Company Incorporated located to the north of the site, and Sika Corporation located to the southwest of the site. These wells have reported depths of 300 and 302 feet below grade, and reported capacities of 145 and 220 gpm, respectively. Except for the Falstrom Company well, all of the wells were located approximately 0.5-mile from the site.

Based on the locations of these wells with respect to the site, it was not anticipated that any cone of depression created from their operation would impact contaminant migration at, or downgradient of the site. However, since industrial pumps are often operated based on demand or run in cycles, the potential existed that an extraction well producing less than 100,000 gpd well (thus not included in the well survey) could be located in close proximity to the site. In order to determine if this scenario exists, the water level study discussed in Section 4.5.3 was performed.

Eighteen contaminated sites were also detected within a 1-mile radius of the site. Of the these 18 sites, four were identified which could potentially provide useful information. Two of the sites, Certified Metals Company and Greater New York Box Company are located to the north of the site and could have impacted ground water quality at the site, based on ground water modeling results. The other two sites, Roberts and Carlson and the former Atlantic Coastal Trucking are located hydraulically downgradient of the site.

4.2 DEPARTMENT FILE REVIEW

As discussed in the previous section, four sites were identified from the well survey that could potentially provide useful information. A summary of the results obtained from the file review of these four sites is presented below.

4.2.1 Certified Metals Company

Certified Metals Company is located north of the site in the industrial complex along Entin Road. The site is primarily impacted by chlorinated VOCs from a 10,000 gallon underground storage tank with a confirmed release. This tank was used for the storage of mineral spirits. The release was discovered in 1991; however, the tank may have been leaking for an extended period of time prior to 1991. Based on the previous operations at the property (dry cleaning solution manufacturing), a potential for the tank to have contained chlorinated organics at some point in time exists.

During the decommissioning of the 10,000 gallon tank in 1991, a second vent pipe unrelated to the known tank was found. This pipe was traced under the building and may be related to a second undetermined source area for impacted ground water.

The shallow ground water flow direction on the Certified Metals site is to the southeast. This flow direction is consistent with the modeled flow direction for non-pumping conditions presented in Section 4.6. Based on this flow direction, impacted ground water in the overburden aquifer migrating from the site would not be expected to impact ground water at the Givaudan-Roure facility. Available records indicate that investigation of the bedrock aquifer has not been completed. However the existence of chlorinated VOCs at elevated concentrations, the 1988 pump test results (Figure 4-1), and the modeled cone of depression based on 1988 pumping conditions (Figure 4-2), suggest that ground water impacted by chlorinated VOCs from Certified Metals that may exist in the bedrock aquifer may have been drawn towards, or onto the Givaudan-Roure property as a result of historical pumping conditions.

4.2.2 Greater New York Box Company

Greater New York Box Company is located to the southeast of Certified Metals Company along Entin Road. Investigations have been performed to assess the impacts of historical leaks from tanks formerly used to fuel automobiles. The primary constituents of concern are benzene, toluene, ethylbenzene and xylene (collectively referred to as BTEX compounds). In addition, chlorinated VOCs are present in on-site shallow ground

Figure 4-1
Historical Ground Water Elevation Map
6 Hours Since Start of Test
31 May 1988 Pump Test (Well 6D)
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

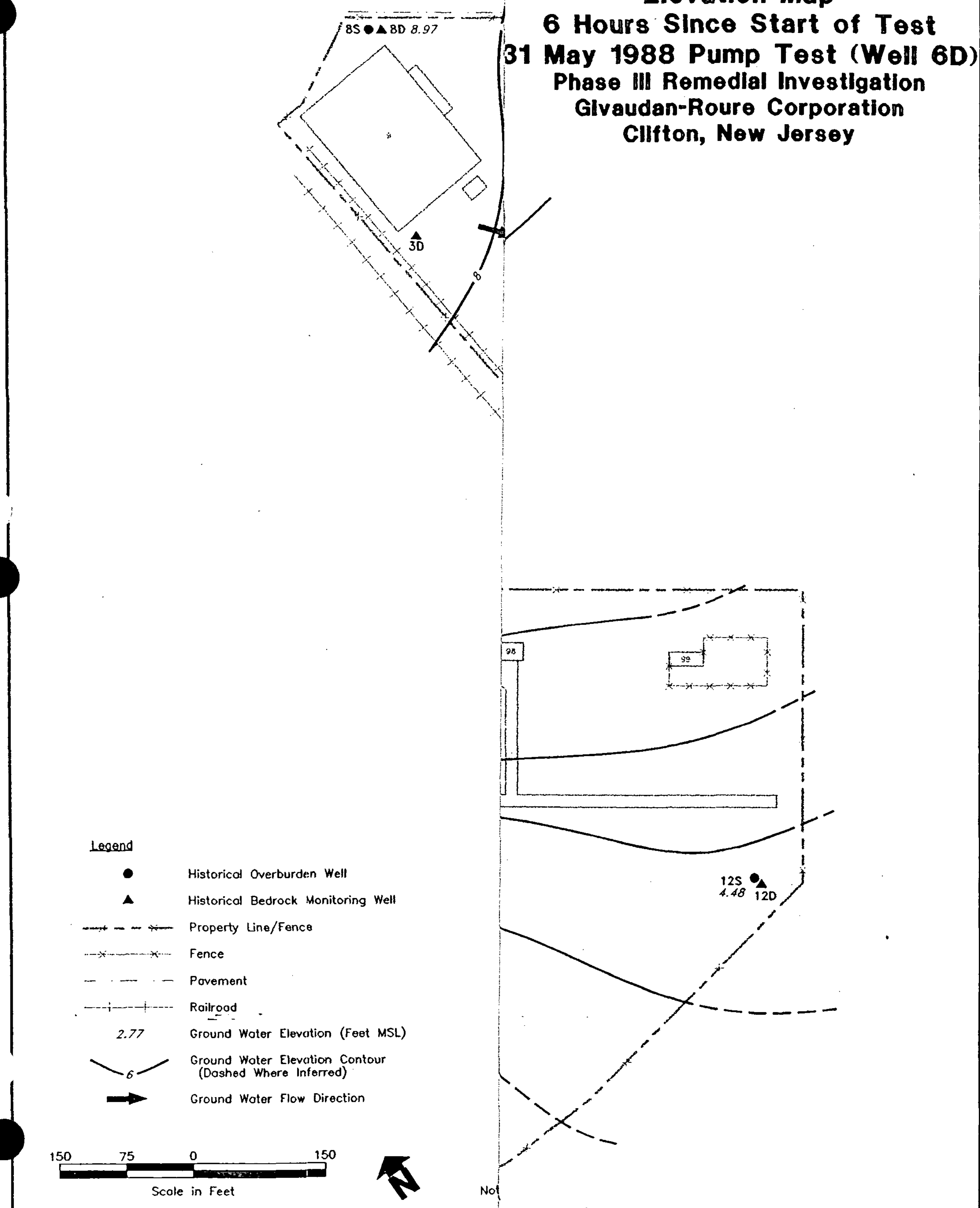
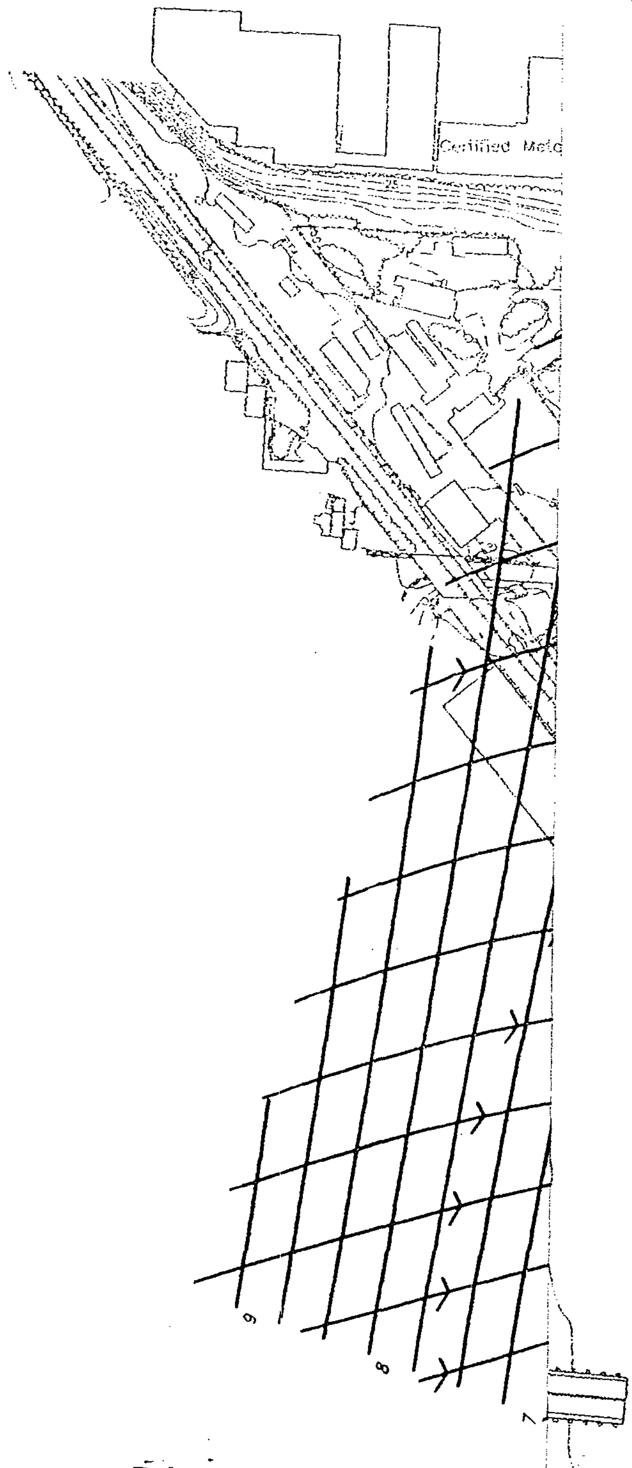


Figure 4-2
Modeled Ground Water Flow
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

▲ Monitoring Well Location (Deep)

——— Modeled Ground Water Contour (Feet, MSL)

—>— Model Ground Water Flow Line

N

400 200 0 400

Scale in Feet

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water. Certified Metals Company, located upgradient of the Greater New York Box Company, has been determined as the source of the chlorinated VOCs. Selected New York Box Company Wells have been periodically sampled as part of the Certified Metals investigation. In addition to the ground water elevation data provided in the files, the plume delineation of chlorinated VOCs onto the Greater New York Box property from Certified Metals supports a southeasterly shallow ground water flow direction.

No investigation of the potential impact to bedrock has been completed.

4.2.3 *Roberts and Carlson*

Roberts and Carlson is located to the northeast of Givaudan-Roure along River Road. BTEX and mercury are the primary constituents of concern at the Roberts and Carlson facility. Several chlorinated organic compounds were also detected at low levels, but have been determined to be from a localized off-site source. A total of 13 monitoring wells currently exist on, and downgradient of the property to assess the impacts of a historic tank release. Consistent with the interpreted ground water flow direction at the Certified Metals Company, shallow ground water flow beneath the Roberts and Carlson property is to the southeast.

4.2.4 *Former Atlantic Coastal Trucking*

The Former Atlantic Coastal Trucking facility, currently owned by Pramar Realty, is located to the southeast of the site along River Road. The constituents of concern in ground water at the site are BTEX compounds, methyl tert-butyl ether (MTBE) and tert-butyl-alcohol (TBA). Ground water has been impacted by releases from tanks used for the storage of gasoline. Gasoline-contaminated soils and free phase liquid were found beneath the former tanks, piping runs and tank islands at the site. The free product plume has been delineated on-site, and the associated dissolved phase plume is inferred to extend only slightly beyond the perimeter of the property.

4.3 *ASSESSMENT OF TOLUENE IN GROUND WATER*

Toluene was detected at several discrete locations on the plant. For discussion purposes, the results of the assessment are presented by area.

A summary of the analytical results from Area D, Consolidated Lumber and Railroad borings is provided in Table 4-1. Logs for the soil borings installed as part of the toluene assessment are included in Appendix D.

Table 4-1
Toluene Delineation Ground Water Sample Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Sample Location	Sample Date	Toluene Concentration (µg/L)
TB-1	29-Jul-97	400
TB-2	25-Jul-97	160
TB-3	21-Jul-97	ND
TB-4	21-Jul-97	2200
TB-5	21-Jul-97	560000
TB-6	23-Jul-97	660000
TB-7	23-Jul-97	ND
TB-8	22-Jul-97	8
TB-9	23-Jul-97	2000
TB-10	25-Jul-97	2
TB-11	22-Jul-97	55
TB-12	25-Jul-97	72
TB-13	29-Jul-97	7100
TB-14	29-Jul-97	1
TB-15	25-Jul-97	7
TB-16	1-Aug-97	1
TB-17	1-Aug-97	880
TB-18	24-Nov-97	ND
TB-19	24-Nov-97	ND
TB-20	24-Nov-97	ND
TB-21	25-Nov-97	ND
TB-22	4-May-98	ND
TB-23	4-May-98	ND
TB-24	5-May-98	ND
TB-25	12-May-98	ND
TB-26	12-May-98	ND
TB-27	13-May-98	ND
RR-B-1	28-Apr-98	8
RR-B-2	28-Apr-98	3200
RR-B-3	29-Apr-98	88000
RR-B-4	6-May-98	ND
RR-B-5	7-May-98	ND
RR-B-6	8-May-98	ND

ND: Not Detected

Figure 4-3 shows the distribution of toluene-impacted ground water along the western property boundary of the site. Figure 4-4 shows the distribution of the constituents detected in soil above the more stringent of the RDCSCC or IGWSCC in Area B. This figure also shows the results of the ground water sample collected from PSD-02 (PSD-02W) which exceeds the GWQS.

Analytical data for all soil and ground water samples collected as part of the assessment of toluene in ground water are included in Appendix E.

4.3.1 *Area E*

As a preliminary step in the assessment of the unexpected detection of toluene in ground water in MW-6S, a soil gas survey was conducted to assist in identifying a potential source area. The methodology for the soil gas survey was discussed in Section 3.

Toluene was detected at low concentrations in 12 of the 36 soil gas borings completed in the area surrounding monitoring well MW-6 (Table 4-2 and Figure 4-5). Data reporting forms from the soil gas survey are included in Appendix F.

The highest concentrations of toluene in soil gas were detected in borings SG-28 and SG-29, just north of monitoring well MW-6. As shown on Figure 4-5, the soil gas sampling locations provided good coverage of the area around monitoring well MW-6. However no trends could be identified to suggest a source area for the toluene-impacted ground water detected in monitoring well MW-6. There are no obvious features or operations in this area which would suggest a source area for the toluene-impacted ground water. Rather these concentrations are likely the result of soil gas migration under the asphalt in this area, or indicative of some previously existing site feature.

Based on the absence of an identified source area for the toluene-impacted ground water, Toluene Monitoring Wells TMW-1 through TMW-4 were installed. These wells along with monitoring wells MW-6S, MW-7S, and MW-18S served to monitor plume migration and determine the lateral extent of the toluene impacted ground water.

Selected wells in the southwestern portion of the property were sampled independent of the comprehensive ground water sampling events performed in March 1997 and November 1997. The objective of these limited sampling events was to determine the lateral extent, migration, and degradation of the toluene originally detected in monitoring well MW-6S in March 1997. Table 4-3 lists the wells sampled and

Table 4-2
Soil Gas Sampling Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Sample I.D.	Toluene (ppm)
SG-1-5'	ND
SG-1-10'	ND
SG-2-5'	ND
SG-2-10'	ND
SG-3-5'	ND
SG-3-10'	ND
SG-4-5'	ND
SG-4-10'	ND
SG-5-5'	ND
SG-5-10'	ND
SG-6-5'	ND
SG-6-10'	ND
SG-7-5'	ND
SG-7-10'	ND
SG-8-5'	ND
SG-8-10'	ND
SG-9-5'	1
SG-9-10'	10
SG-9-20'	ND
SG-10-5'	<1
SG-10-10'	<1
SG-11-5'	ND
SG-11-10'	ND
SG-12-5'	ND
SG-12-10'	ND
SG-13-5'	ND
SG-13-10'	ND
SG-14-5'	1
SG-14-10'	<1
SG-15-5'	ND
SG-15-10'	2
SG-16-5'	ND
SG-16-10'	1
SG-17-5'	<1
SG-17-10'	ND
SG-18-5'	2
SG-18-10'	5
SG-19-5'	1
SG-19-10'	ND
SG-20-5'	ND

ND: Not Detected

Table 4-2
Soil Gas Sampling Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Sample I.D.	Toluene (ppm)
SG-20-10'	ND
SG-21-5'	ND
SG-21-10'	ND
SG-22-5'	ND
SG-22-10'	ND
SG-23-5'	ND
SG-23-10'	ND
SG-24-5'	<1
SG-24-10'	ND
SG-25-5'	ND
SG-25-10'	ND
SG-26-5'	ND
SG-26-10'	ND
SG-27-5'	ND
SG-27-10'	ND
SG-28-5'	13
SG-28-10'	3
SG-28-15'	1
SG-28-23'	ND
SG-29-5'	1
SG-29-10'	344
SG-29-15'	32
SG-29-20'	1
SG-30-5'	ND
SG-30-10'	2
SG-31-5'	ND
SG-31-10'	ND
SG-32-5'	ND
SG-32-10'	ND
SG-33-5'	ND
SG-33-10'	ND
SG-34-5'	ND
SG-34-10'	ND
SG-35-5'	ND
SG-35-10'	ND
SG-36-5'	ND
SG-36-10'	ND

ND: Not Detected

Figure 4-3
Toluene Delineation Boring Analytical Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

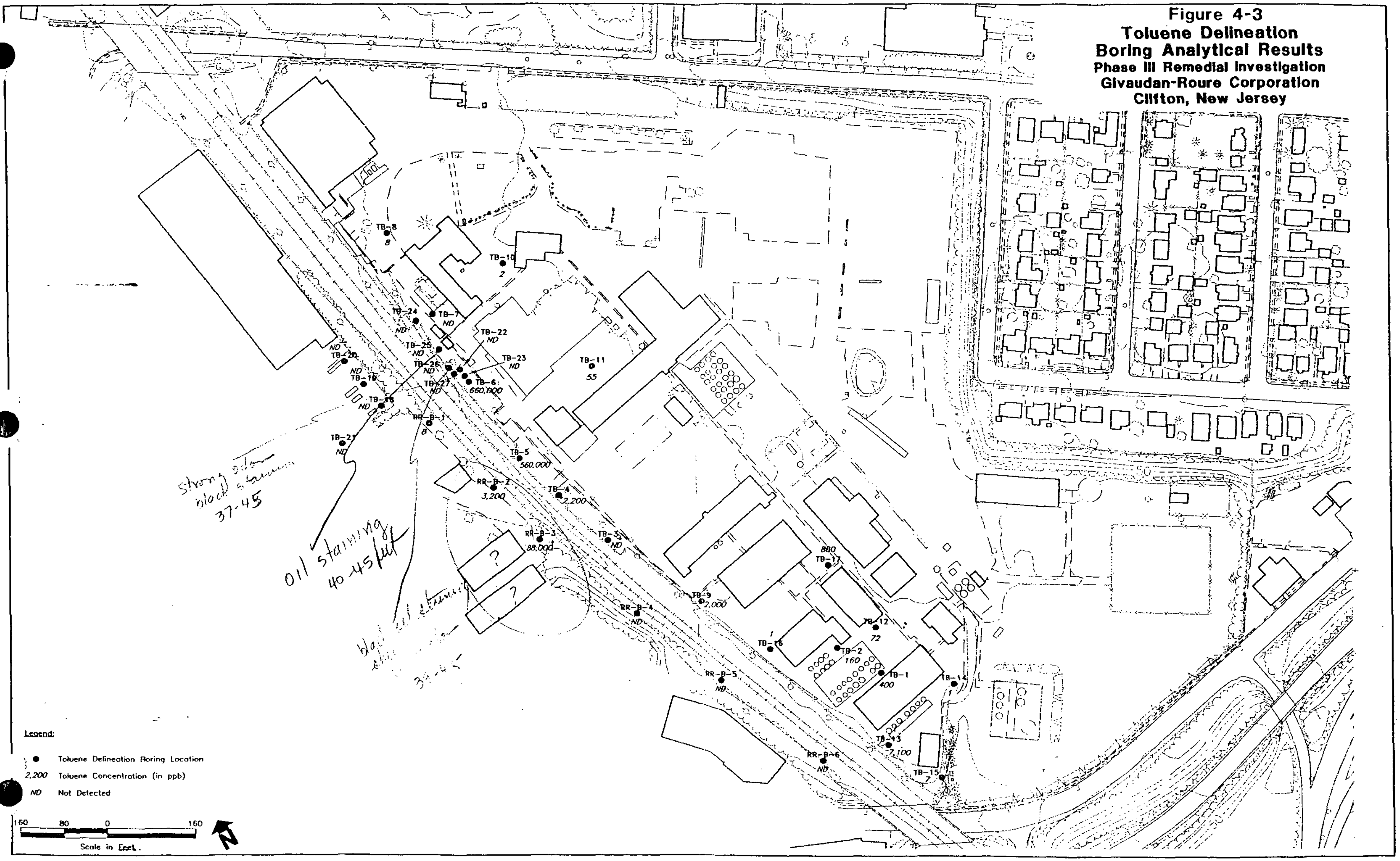

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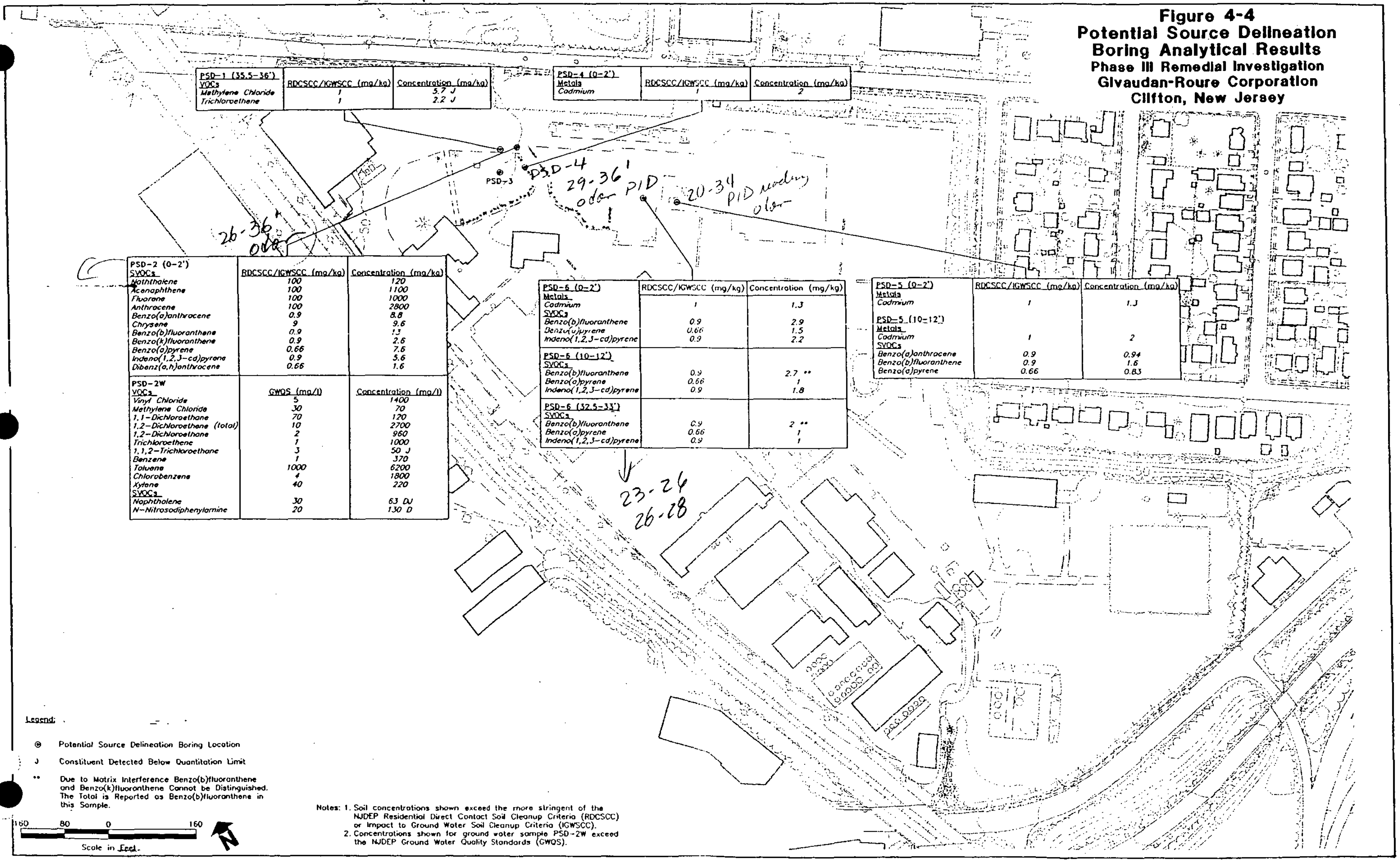
Figure 4-4
Potential Source Delineation Boring Analytical Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



PSD-1 (35.5-36') VOCs	RDCSCC/IGWSCC (mg/kg)	Concentration (mg/kg)
Methylene Chloride	1	5.7 J
Trichloroethene	1	2.2 J

PSD-4 (0-2') Metals	RDCSCC/IGWSCC (mg/kg)	Concentration (mg/kg)
Cadmium	1	2

PSD-2 (0-2') SVOCs	RDCSCC/IGWSCC (mg/kg)	Concentration (mg/kg)
Naththalene	100	120
Acenaphthene	100	1100
Fluorene	100	1000
Anthracene	100	2800
Benzo(a)anthracene	0.9	8.8
Chrysene	9	9.6
Benzo(b)fluoranthene	0.9	13
Benzo(k)fluoranthene	0.9	2.6
Benzo(a)pyrene	0.66	7.6
Indeno(1,2,3-cd)pyrene	0.9	5.6
Dibenz(a,h)anthracene	0.66	1.6
PSD-2W		
VOCs	GWQS (mg/l)	Concentration (mg/l)
Vinyl Chloride	5	1400
Methylene Chloride	30	70
1,1-Dichloroethane	70	120
1,2-Dichloroethene (total)	10	2700
1,2-Dichloroethane	2	960
Trichloroethene	1	1000
1,1,2-Trichloroethane	3	50 J
Benzene	1	370
Toluene	1000	6200
Chlorobenzene	4	1800
Xylene	40	220
SVOCs		
Naphthalene	30	63 DJ
N-Nitrosodiphenylamine	20	130 D

PSD-6 (0-2')	RDCSCC/IGWSCC (mg/kg)	Concentration (mg/kg)
Metals		
Cadmium	1	1.3
SVOCs		
Benzo(b)fluoranthene	0.9	2.9
Benzo(a)pyrene	0.66	1.5
Indeno(1,2,3-cd)pyrene	0.9	2.2
PSD-6 (10-12')		
SVOCs		
Benzo(b)fluoranthene	0.9	2.7 **
Benzo(a)pyrene	0.66	1
Indeno(1,2,3-cd)pyrene	0.9	1.8
PSD-6 (32.5-33')		
SVOCs		
Benzo(b)fluoranthene	0.9	2 **
Benzo(a)pyrene	0.66	1
Indeno(1,2,3-cd)pyrene	0.9	1

PSD-5 (0-2')	RDCSCC/IGWSCC (mg/kg)	Concentration (mg/kg)
Metals		
Cadmium	1	1.3
PSD-5 (10-12')		
Metals		
Cadmium	1	2
SVOCs		
Benzo(a)anthracene	0.9	0.94
Benzo(b)fluoranthene	0.9	1.6
Benzo(a)pyrene	0.66	0.83

Legend:

- ⊙ Potential Source Delineation Boring Location
- J Constituent Detected Below Quantitation Limit
- ** Due to Matrix Interference Benzo(b)fluoranthene and Benzo(k)fluoranthene Cannot be Distinguished. The Total is Reported as Benzo(b)fluoranthene in this Sample.

Notes:
1. Soil concentrations shown exceed the more stringent of the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) or Impact to Ground Water Soil Cleanup Criteria (IGWSCC).
2. Concentrations shown for ground water sample PSD-2W exceed the NJDEP Ground Water Quality Standards (GWQS).

Figure 4-5
Soil Gas Sampling Analytical Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

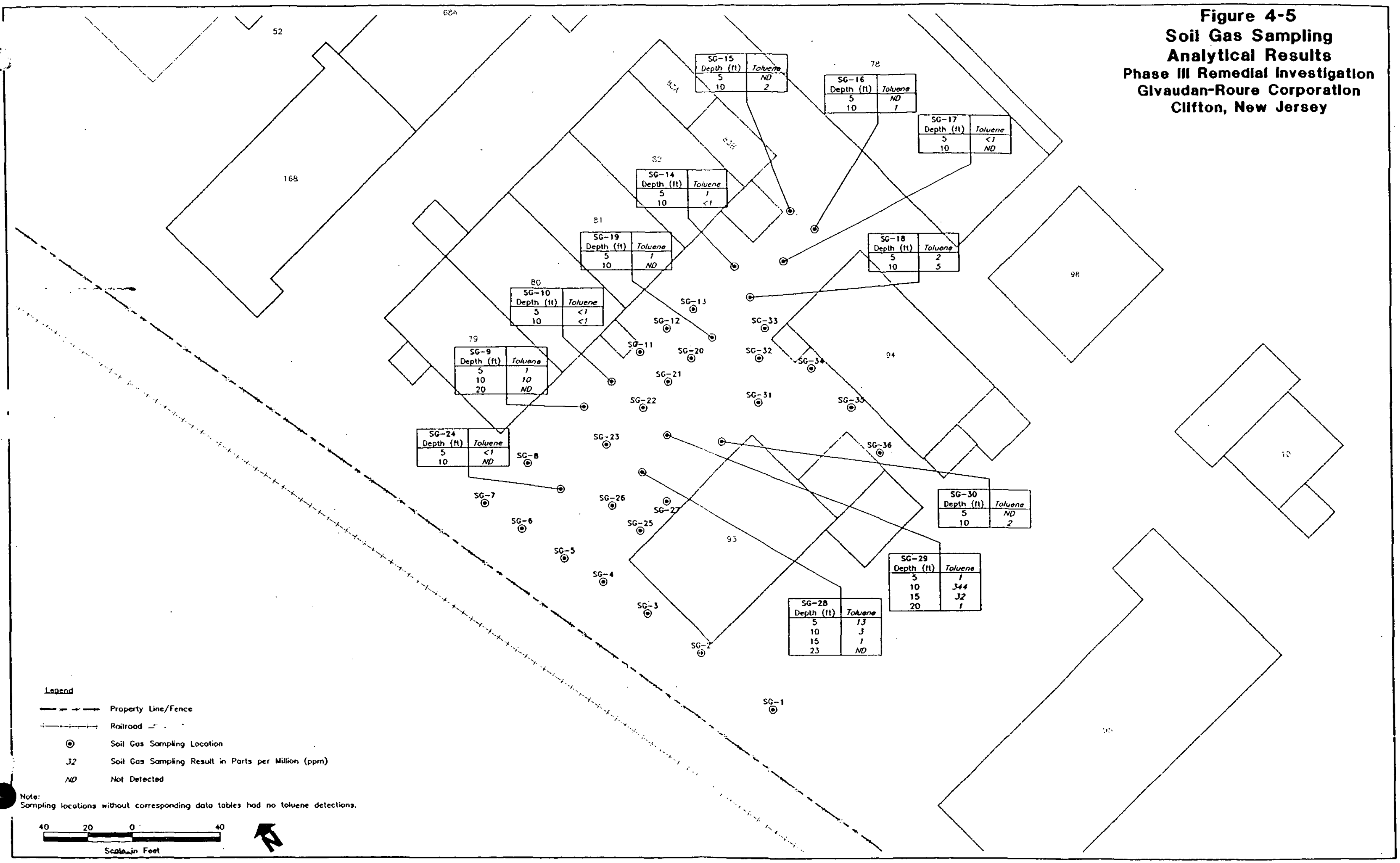


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Table 4-3
Toluene Analytical Results Comparison
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Monitoring Well #	March 1997	April 1997	June 1997	August 1997	November 1997	May 1998
MW-6S	34000	9800	1900	817	150	16
MW-7S	250	9700	19000	10500	2300(D)	190
MW-9S	9000	3600	4100	9110	6100(D)	NS
MW-18S	NI	NI	NI	NI	ND	ND
TMW-1S	NI	NI	NI	NI	59	4.9
TMW-2S	NI	NI	NI	NI	ND	ND
TMW-3S	NI	NI	NI	NI	21	ND
TMW-4S	NI	NI	NI	NI	9(J)	10

Toluene Concentrations in µg/l (ppb)
D: This qualifier identifies all compounds detected in an analysis at a secondary dilution factor.
J: Indicates an estimated value
ND: Not detected
NI: Not installed at time of sampling
NS: Not sampled

concentrations of toluene detected for each of the ground water sampling events (selected wells and comprehensive) since January 1996. January 1996 was the last sampling event performed prior to the detection of toluene at an elevated concentration in monitoring well MW-6S in March 1997. Laboratory report forms provided by CoreLabs are included in Appendix G.

No definitive source area for the toluene plume could be identified. However, as shown on Figure 4-6, the toluene plume has migrated to the south from MW-6S to MW-7S. The graphs of the toluene concentrations presented in Figure 4-6 show that the plume has naturally attenuated to concentrations below the GWQS. Further evidence that toluene-impacted ground water at concentrations exceeding the GWQS does not extend beyond the property boundary is provided by the absence of toluene in monitoring well MW-18S and boring RR-B-6.

4.3.2 *Area D and Area E*

Twenty-three borings (TB-1 through TB-17, and TB-22 through TB-27) were completed on the site for the purpose of collecting in-situ ground water samples for toluene analysis (Figure 3-2). Toluene was detected at concentrations exceeding the GWQS in only five of the 23 borings.

The highest concentrations of toluene observed in ground water at the site were detected in borings TB-5 and TB-6. Soil samples collected from borings TB-22 through TB-27 (Table 4-4), located upgradient of borings TB-5 and TB-6, also contained toluene at varying depth intervals. These data, along with recent findings about historical operations in this area have served to identify a source for the toluene impacted ground water observed in monitoring well MW-9S. Based on discussions with long term employees, the area in the immediate vicinity of borings TB-5 and TB-6 was used for offloading of tanker cars, and for horizontal drum storage. No record of this was found in site files; however the data supports the scenario described by veteran employees.

As previously mentioned, toluene-impacted ground water was first observed in MW-6 in March 1997. No apparent trends can be identified from the soil boring analytical results obtained in Areas D and E to suggest a source area. The concentration of toluene detected in boring TB-13 (7,100 μg/l) is consistent with the ground water results from MW-7S. However, the concentrations of toluene detected upgradient of MW-7S do not indicate a continuing source, or point to a residual source area. Despite these data and the soil gas results, the exact source area for the toluene originally detected in MW-6 has not been identified. Based on the

Figure 4-6
Toluene Analytical Results Comparison
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

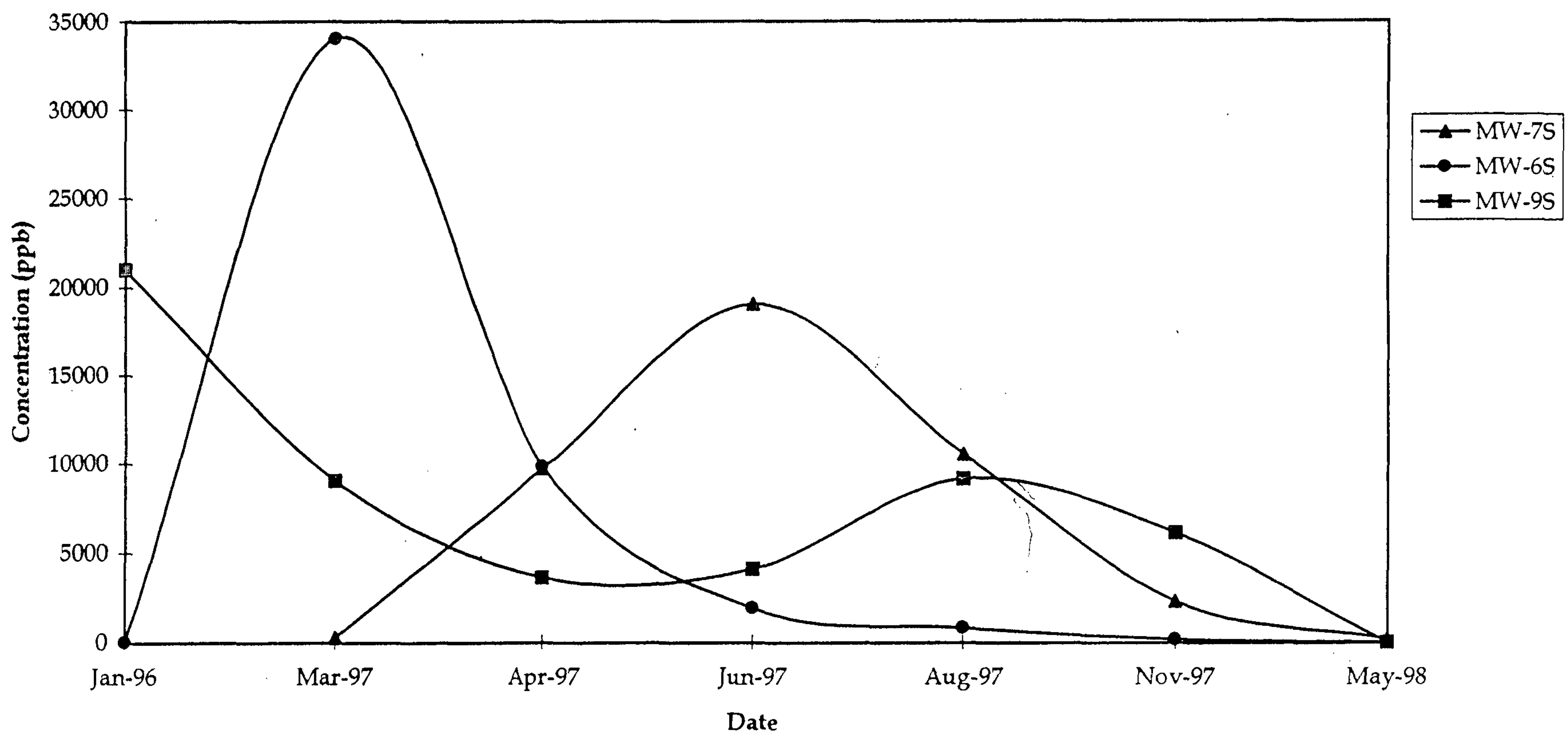

Table 4-4
Toluene Delineation Soil Sample Results
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Sample Location	Sample Date	Sample Depth (ft)	Toluene Concentration (µg/kg)
TB-22	4 May 1998	5-7	1200(B)
	4 May 1998	15-17	1100(B)
	4 May 1998	35-37	950(B)
TB-23	4 May 1998	5-7	800(B)
	4 May 1998	15-17	930(B)
	4 May 1998	37-39	680(B)
TB-24	5 May 1998	38-40	630(B)
TB-25	12 May 1998	38-40	1400(B)
TB-26	12 May 1998	37-39	3000(B)
TB-27	13 May 1998	37-39	900(B)

Qualifier Code
B: This result is qualitatively invalid because the compound was also detected in a blank.

ground water data from surrounding wells, the source area is apparently between the Building 80's row and Building 93.

Based on the low concentrations of toluene observed both upgradient and downgradient of TB-9, the concentration of toluene at that boring is not believed to be related to the concentrations seen in wells MW-6S and MW-7S, or MW-9S. The low concentrations detected in surrounding borings suggests that this is a remnant of some historical operations or event.

4.3.3 *Consolidated Lumber Borings*

Based on the concentrations of toluene detected in borings TB-5 and TB-6, further delineation of toluene-impacted ground water was required to the west of the site. Therefore, borings TB-18 through TB-21 were installed in the Consolidated Lumber property to delineate the lateral extent of toluene-impacted ground water to the northwest of the site.

Toluene was not detected in any of the borings completed on the Consolidated Lumber property. The absence of toluene in these borings supports the interpreted shallow ground water flow direction. In the shallow aquifer, the effect of ground water mounding from the storm water retention pond drives ground water in a northwesterly direction. It is then interpreted to turn off to the west and southwest and run parallel to the railroad tracks towards the Passaic River. The absence of toluene in the Consolidated Lumber borings demonstrates that the northern extent of toluene-impacted ground lies to the south of Consolidated Lumber's property.

4.3.4 *Railroad Borings*

The Railroad borings were completed to continue the delineation of the toluene-impacted areas observed along the western perimeter of the site. Consistent with the interpretation of shallow ground water flow and contaminant migration discussed above, the data from borings RR-B-2 and RR-B-3, respectively, define the edge and core of the toluene plume which originates between borings TB-5 and TB-6. The distribution of toluene and orientation of the plume axis approximately parallel to the railroad tracks provide further evidence that shallow ground water is flowing to the south and southwest towards the Passaic River.

The absence of toluene in Railroad borings RR-B-4 through RR-B-6 further demonstrates that the toluene-impacted ground water detected at the southwestern portion of the site is not related to the source area near borings TB-5 and TB-6. Additionally, these data show that the toluene impacts in this area have naturally attenuated. On-site areas impacted by toluene at concentrations exceeding the GWQS have been delineated by non-detects and concentrations below the GWQS in the samples collected from on-site wells MW-7S and MW-18S in May 1998. A more detailed discussion of the analytical results obtained from the focused sampling in this area to track and delineate the toluene-impacted ground water is provided in Section 5.1.5.

4.3.5 *Other Constituents Detected in Area B*

Low concentrations of VOCs, SVOCs and metals were detected in the soil samples from the Potential Source Delineation borings installed in Area B (Figure 4-4). Except for several polynuclear aromatic hydrocarbons (PAHs) detected in the 0-2-foot sample from boring PSD-2, the concentrations of organic and inorganic constituents detected in the soil collected from the Potential Source Delineation borings are just above the RDCSCC. These concentrations suggest that the areas where the borings were completed are not a significant source for impacts to ground water.

The ground water sample collected from boring PSD-02 did however suggest that a source for 1,2-DCA and other chlorinated VOCs was located somewhere upgradient of this location. Based on the mounding effect created from the storm water retention pond, a source area for ground water impacted by chlorinated VOCs may exist to the south and/or southeast of boring PSD-02. In addition to the chlorinated VOCs detected in this sample, BTEX compounds were also detected at elevated concentrations. The concentrations of chlorinated VOCs detected in this sample are significant because if a source area exists in this area, it would help to explain the detection of 1,2-DCA in monitoring well MW-24D. Further discussion of this area and its potential impacts on the site conceptual model is presented in Section 5.

4.4 *COMPREHENSIVE SUMMARY OF GROUND WATER RESULTS*

The following sections summarize the ground water analytical results for samples collected from the previously existing and recently installed monitoring wells. Based on the distribution of the wells and an assessment of the ground water analytical results, the wells can be subdivided into the following four groups:

- <u>Northwest Perimeter Wells:</u> These wells are located along the northwest property boundary of the site and include MW-3S, MW-3DR, MW-8S, MW-8D, and MW-23S. Well nests 3 and 8 were installed during the Phase I RI. Well MW-23S was installed during the Phase III

RI to further assess background metal concentrations in an area upgradient of plant operations areas.

- Interior wells: These wells are located within the "interior" of the plant property, near current or former plant operations areas. Wells MW-1, MW-2, and well nests 5, 6, 9, and 14 were installed prior to the Phase III RI. Wells TMW-1, TMW-2, TMW-3, TMW-4, MW-19, MW-20, MW-21, MW-22, and well nest 15 were installed during the Phase III RI to further assess impacts to ground water from previously identified areas of concern.

- Downgradient Perimeter Wells: These wells are hydraulically downgradient of plant operations areas. Well nests 7, 10, 11, and 12 were installed prior to this investigation. Well nests 16, 17, and 18 were installed during the Phase III RI to further delineate the extent of ground water contamination and to monitor VOCs potentially migrating off site.

- Downgradient Offsite Wells: These wells are hydraulically downgradient of the site and include well nests 24, 25, and 26 and wells MW-27D, MW-28D, MW-29D. They were all installed during the Phase III RI to determine the off-site extent of site-related ground water contamination for the purpose of establishing Classification Exemption Area (CEA) boundaries.

4.4.1 *June 1988 Analytical Results*

The following section summarizes the groundwater analytical results obtained during the June 1988 sampling event. The adoption of the Department's Ground Water Quality Standards (GWQS) postdates this sampling event and the original presentation of these results to the Department. However this report compares the data to these standards so that trends in contaminant concentrations between this and recent sampling events are more easily identified. Data summary tables of the organic and inorganic constituents detected are provided in the Analytical Quality Assurance Report included in Appendix M of the report entitled *Revised Draft Remedial Investigation Report* (ERM, October 1988, Revised September 1991.)

4.4.1.1 *Volatile Organic Compounds*

One or more VOCs were detected at concentrations exceeding the current GWQS in seventeen of the eighteen site monitoring wells. MW-6BS, located in the vicinity of the current well nest 18, was the exception but is believed to have been set in a perched aquifer. This well has since been abandoned and is not part of the current monitoring network.

Three VOCs were detected at concentrations exceeding their respective current GWQS in the northwest perimeter wells. Trichloroethene (TCE) was detected at a concentration of 34 μg/l in well MW-3D. Chloroform was present in MW-8D at 18 μg/l. Toluene was detected in MW-8S at a concentration of 3,100 μg/l.

A total of 14 VOCs were detected at concentrations exceeding the current GWQS in the interior wells. Of those VOCs, the peak on-site concentrations for 8 of the 14 VOCs detected were observed in well MW-5S. Monitoring well MW-9S contained the second highest concentration of VOCs onsite but only toluene was detected in this well.

Five VOCs were found to exceed the current GWQS in at least one of the eight downgradient perimeter wells. Each of the downgradient perimeter wells, except MW-12S, contained 1,2-DCA, with a maximum onsite concentration of 1,100 μg/l detected in MW-10D. The highest onsite detection of chloroform was 140 μg/l in MW-10SA. TCE was detected in 4 of the 5 shallow wells, but not in any of the deep bedrock wells.

4.4.1.2 *Semi-Volatile Organic Compounds*

One or more Semi-Volatile Organic Compounds (SVOCs) were detected at concentrations exceeding the current GWQS in three of the eighteen site monitoring wells. In monitoring well MW-5S, n-nitrosodiphenylamine and bis (2-ethylhexyl) phthalate were detected at concentrations of 100 and 170 μg/l respectively. The concentration of bis (2-ethylhexyl) phthalate is qualitatively invalid because it was also detected in the method blank. In MW-6S, concentrations of 1,2,4-trichlorobenzene and naphthalene were estimated at 13 and 95 μg/l, respectively. Naphthalene was also detected in MW-8S at a concentration of 300 μg/l.

4.4.1.3 *Metals*

One or more metals were detected in unfiltered samples collected from each of the monitoring wells. Three metals: sodium, manganese, and iron were consistently detected at concentrations higher than their current GWQS. The ubiquitous occurrence and distribution of these metals suggests that they are naturally occurring and related to the suspended solids fraction in the unfiltered samples.

In addition to these metals, the only metals which exceed the current GWQS were detected in the interior wells. Nickel and arsenic were detected at respective concentrations of 176 and 24.6 μg/l in well MW-5D. The concentrations of arsenic and chromium detected in MW-5S were 9 and 205 μg/l, respectively. The occurrence of these constituents in only the well nest 5 area and coincidental detection with the highest VOC concentrations suggests that they may be site-related. However, because these are unfiltered samples, the detection of these metals also could have been related to naturally occurring suspended solids.

4.4.2 *January 1996 Analytical Results*

The following section summarizes the groundwater analytical results obtained during the January 1996 sampling event. Organic and inorganic constituents detected at concentrations which exceed the GWQS are presented in Plate 2. Comprehensive data summary tables of all of the organic and inorganic constituents detected are provided in the Analytical Quality Assurance Report included in Appendix D of the report entitled *Phase II Remedial Investigation for Ground Water* (ERM, 1997).

4.4.2.1 *Volatile Organic Compounds*

One or more VOCs were detected at concentrations exceeding the GWQS in 21 of the 28 existing site monitoring wells.

Two VOCs were detected at concentrations exceeding the GWQS in two of the four northwest perimeter wells. Benzene was detected at an estimated concentration of 2 μg/l in MW-8S and TCE was detected in MW-3DR at a concentration of 21 μg/l. Based on the history of bordering properties and analytical results generated during the Phase II RIGW, these results were believed until now to be related to historical and/or present off-site conditions and not related to site activities. However, the VOCs detected at concentrations exceeding the GWQS in the in-situ ground water sample collected from boring PSD-02 now suggest a potential on site source for the low TCE concentrations observed in MW-3DR.

The detection of VOCs at concentrations exceeding the GWQS in monitoring wells located in the "interior" of the plant property is consistent with the soil analytical results obtained from soil borings completed in these areas during the RIS. Similar VOCs were detected in soil borings completed adjacent to or upgradient of these wells/well nests, indicating likely on-site sources for locally impacted ground water.

One or more VOCs were detected above the GWQS in eight of the eleven downgradient perimeter wells. No VOCs were detected in monitoring wells MW-7S and 11S, and in well MW-12S, only chloroform was detected. The absence of VOCs in these shallow wells is consistent with the findings of the soil borings advanced in the eastern and southeastern portions of the site during the RIS. The absence of VOCs, and specifically of 1,2-DCA, in the shallow overburden wells in the southeastern portion of the property indicates that no sources for impacts to groundwater exist in this area.

4.4.2.2 *Semi-Volatile Organic Compounds*

SVOCs were detected at concentrations exceeding the GWQS in only 2 of the 28 site monitoring wells. Bis (2-ethylhexyl) phthalate, a common laboratory contaminant, and pentachlorophenol were detected in MW-2 at concentrations of 77 and 3 µg/l, respectively. Naphthalene was detected at a concentration of 65 µg/l in MW-5SR. This value is not shown on Plate 2 because the GWQS of 30 µg/l for naphthalene was not adopted at the time this figure was originally submitted to the Department.

4.4.2.3 *Metals*

One or more metals were detected in unfiltered samples collected from each of the site monitoring wells. Four metals: aluminum, iron, manganese, and sodium were detected consistently across the site at similar concentrations. The ubiquitous occurrence of these metals and detection of these constituents in wells located hydraulically downgradient of areas of concern (AOCs) at concentrations similar to those detected in wells located upgradient of production areas, suggests that these metals are naturally occurring and are artifacts of the suspended solids fraction of the unfiltered samples.

Several other metals (cadmium, chromium, lead, and nickel) were detected in wells in, or downgradient of, principal source areas. The occurrence of these metals is localized and may therefore be attributable to leaching of inorganic constituents in these localized source areas. However, because these samples were unfiltered, these results also may be related to naturally occurring suspended solids.

As discussed in the report entitled *Remedial Investigation Report for Soils* (ERM, Revised October 1997), metals were detected at concentrations exceeding the RDCSCC in only 11 of 222 soil samples collected during the RIS. The location of these samples generally occurred coincidentally with AOCs identified for organic constituents

4.4.3 *March 1997 Analytical Results*

This section summarizes the analytical results obtained during the March 1997 ground water sampling event. Organic and total inorganic constituents detected at concentrations which exceed the GWQS are summarized in Plate 3. Data summary and comprehensive tables of all of the organic and inorganic constituents detected are provided in Appendices A and B of the report entitled *March 1997 Supplemental Ground Water Investigation, Phase II Remedial Investigation for Ground Water* (ERM, June 1997).

4.4.3.1 *Volatile Organic Compounds*

Except for TCE, no VOCs were detected above the GWQS in the northwestern perimeter wells. TCE was detected in MW-3DR at a lower concentration (4 μg/l) than was detected in January 1996 (21 μg/l). As discussed in Section 4.4.2.1, the TCE detected in MW- 3DR may be related to the VOCs detected in the in-situ ground water sample collected from boring PSD-02.

The detection of VOCs at concentrations exceeding the GWQS in the Interior Wells is consistent with the findings of the Phase II RIGW. Soil analytical results obtained during the RIS in the interior plant property also detected similar VOCs. In general, concentrations of VOCs detected in the Interior Wells can be correlated with VOCs detected in soil borings adjacent to or upgradient of these wells/well nests.

With respect to concentration and distribution, the VOCs detected in the Interior and Downgradient Wells during the March 1997 sampling event were mostly consistent with the analytical results from January 1996. A decreasing trend in VOC concentrations was observed. However, based on the available ground water data, identification of concentration trends is difficult given the potential impact of seasonal ground water fluctuations. The exception to this decreasing trend was the unexpected detection of toluene in monitoring well MW-6 at a concentration of 34,000 μg/l.

4.4.3.2 *Semi-Volatile Organic Compounds*

Consistent with previous sampling events, SVOCs were detected at concentrations above the GWQS in only two site wells. Bis (2-ethylhexyl phthalate) was detected in MW-9I at a concentration of 550 μg/l. However, since bis (2-ethylhexl phthalate) is a common laboratory cross-contaminant and its occurrence is localized, the detection of this compound is interpreted to be a laboratory artifact and not the result of

TABLE 4-5
EXCEEDANCES OF NJDEP GROUND WATER QUALITY STANDARDS (GWQS)
CORE LABORATORIES GROUND WATER ANALYTICAL RESULTS
NOVEMBER 1997 GROUND WATER SAMPLING EVENT
PHASE III GROUND WATER INVESTIGATION
GIVAUDAN-ROURE CORPORATION
CLIFTON, NEW JERSEY
REPORT DATE 02/18/98

GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
A.VOA	1,2-DICHLOROETHANE	DUPLICATE	UG/L	2.00	MW-16A	GSAI	22.00	
		MONITORING WELL	UG/L	2.00	MW-05I	GSAI	8.00	J
					MW-07D	GSAI	230.00	D
					MW-07I	GSAI	21.00	
					MW-10D	GSAI	280.00	D
					MW-10S	GSAI	190.00	
					MW-11D	GSAI	590.00	D
					MW-12D	GSAI	190.00	D
					MW-12I	GSAI	72.00	
					MW-14D	GSAI	130.00	
					MW-15D	GSAI	200.00	D
					MW-16D	GSAI	21.00	
					MW-16I	GSAI	65.00	
					MW-17D	GSAI	100.00	
					MW-17I	GSAI	110.00	
					MW-18D	GSAI	110.00	
					MW-18I	GSAI	180.00	
					MW-24D	GSAI	2,100.00	D
					MW-24I	GSAI	16.00	
					MW-25D	GSAI	230.00	D
					MW-26I	GSAI	10.00	
	1,2-DICHLOROETHENE (TOTAL)	MONITORING WELL	UG/L	10.00	MW-14D	GSAI	15.00	
	1,2-DICHLOROPROPANE	MONITORING WELL	UG/L	1.00	MW-06S	GSAI	17.00	
		TOLUENE MONITOR WELL	UG/L	1.00	TMW-03S	GSAI	11.00	
	ACETONE	MONITORING WELL	UG/L	700.00	MW-02	GSAI	9,300.00	D
					MW-07S	GSAI	1,800.00	
	BENZENE	MONITORING WELL	UG/L	1.00	MW-01	GSAI	23.00	J
					MW-02	GSAI	22.00	J
					MW-06S	GSAI	7.00	J
					MW-14S	GSAI	3.00	J
		TOLUENE MONITOR WELL	UG/L	1.00	TMW-03S	GSAI	4.00	J
	BROMOMETHANE	MONITORING WELL	UG/L	10.00	MW-02	GSAI	27.00	JB
					MW-22	GSAI	210.00	J
	CHLOROFORM	DUPLICATE	UG/L	6.00	MW-12A	GSAI	12.00	
		MONITORING WELL	UG/L	6.00	MW-12S	GSAI	12.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

EXCEEDANCES OF NJDEP GROUND WATER QUALITY STANDARDS (GWQS)
CORE LABORATORIES GROUND WATER ANALYTICAL RESULTS
NOVEMBER 1997 GROUND WATER SAMPLING EVENT
PHASE III GROUND WATER INVESTIGATION
GIVAUDAN-ROURE CORPORATION
CLIFTON, NEW JERSEY
REPORT DATE 02/18/98

GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
A.VOA	CHLOROFORM	MONITORING WELL	UG/L	6.00	MW-14S	GSAI	7.00	J
	CHLOROMETHANE	MONITORING WELL	UG/L	30.00	MW-22	GSAI	120.00	JB
	ETHYLBENZENE	MONITORING WELL	UG/L	700.00	MW-01	GSAI	4,000.00	D
					MW-02	GSAI	8,100.00	D
	METHYLENE CHLORIDE	EQUIPMENT BLANK	UG/L	2.00	RB-971120	GSAI	4.00	J
					RB-971125	GSAI	6.00	JB
		FIELD BLANK	UG/L	2.00	FB-971117	GSAI	3.00	J
					FB-971120	GSAI	4.00	J
					FB-971125	GSAI	6.00	JB
		MONITORING WELL	UG/L	2.00	MW-09I	GSAI	5.00	J
					MW-15D	GSAI	3.00	JB
					MW-16S	GSAI	3.00	JB
					MW-22	GSAI	210.00	JB
					MW-23	GSAI	3.00	JB
		TRAVEL BLANK	UG/L	2.00	TB-971124	GSAI	4.00	JB
					TB-971124B	GSAI	3.00	JB
	TETRACHLOROETHENE	MONITORING WELL	UG/L	1.00	MW-02	GSAI	21.00	J
					MW-14S	GSAI	4.00	J
					MW-15S	GSAI	2.00	J
	TOLUENE	MONITORING WELL	UG/L	1,000.00	MW-02	GSAI	6,900.00	D
					MW-07S	GSAI	2,300.00	D
					MW-09S	GSAI	6,100.00	D
					MW-19	GSAI	4,800.00	D
					MW-22	GSAI	45,000.00	D
	TRICHLOROETHENE	MONITORING WELL	UG/L	1.00	MW-03DR	GSAI	9.00	J
					MW-05DR	GSAI	2.00	J
					MW-05SR	GSAI	3.00	J
					MW-06S	GSAI	3.00	J
					MW-18S	GSAI	2.00	J
					MW-21	GSAI	49.00	
		TOLUENE MONITOR WELL	UG/L	1.00	TMW-03S	GSAI	6.00	J
	XYLENE (TOTAL)	MONITORING WELL	UG/L	40.00	MW-06S	GSAI	43.00	
					MW-14S	GSAI	46.00	
					MW-15S	GSAI	49.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GIVAUDAN-ROURE CORPORATION
CLIFTON, NEW JERSEY
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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE		AMOUNT	Q

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
A2.DCE ISO	CIS-1,2-DICHLOROETHENE	MONITORING WELL	UG/L	10.00	MW-14D	GSAI	15.00	
B.SVOA	NAPHTHALENE	MONITORING WELL	UG/L	30.00	MW-05SR	GSAI	99.00	D
					MW-22	GSAI	170.00	D
	PENTACHLOROPHENOL	MONITORING WELL	UG/L	1.00	MW-02	GSAI	3.00	J
E.METALS	ALUMINUM	DUPLICATE	UG/L	200.00	MW-16A	GSAI	826.00	
		MONITORING WELL	UG/L	200.00	MW-01	GSAI	306.00	
					MW-02	GSAI	1,350.00	
					MW-05DR	GSAI	210.00	B
					MW-05SR	GSAI	3,430.00	
					MW-06S	GSAI	22,400.00	
					MW-07S	GSAI	6,500.00	
					MW-09D	GSAI	716.00	
					MW-09I	GSAI	232.00	
					MW-09S	GSAI	4,100.00	
					MW-12I	GSAI	997.00	
					MW-14I	GSAI	1,120.00	
					MW-14S	GSAI	2,680.00	
					MW-15I	GSAI	1,020.00	
					MW-15S	GSAI	3,160.00	
					MW-16D	GSAI	943.00	
					MW-16I	GSAI	14,600.00	
					MW-16S	GSAI	1,330.00	
					MW-17D	GSAI	205.00	B
					MW-17I	GSAI	1,390.00	
					MW-17S	GSAI	962.00	
					MW-18I	GSAI	5,960.00	
					MW-18S	GSAI	1,890.00	
					MW-19	GSAI	3,350.00	
					MW-21	GSAI	1,910.00	
					MW-23	GSAI	452.00	
					MW-26S	GSAI	434.00	
		TOLUENE MONITOR WELL	UG/L	200.00	TMW-01S	GSAI	2,190.00	
					TMW-03S	GSAI	1,850.00	
					TMW-04S	GSAI	975.00	
	ANTIMONY	DUPLICATE	UG/L	20.00	MW-16A	GSAI	23.00	B

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

EXCEEDANCES OF NJDEP GROUND WATER QUALITY STANDARDS (GWQS)
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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
E.METALS	ANTIMONY	MONITORING WELL	UG/L	20.00	MW-15S	GSAI	21.10	B
					MW-16D	GSAI	23.40	B
	ARSENIC	MONITORING WELL	UG/L	8.00	MW-06S	GSAI	20.60	
					MW-07S	GSAI	157.00	
					MW-08S	GSAI	10.00	B
					MW-11S	GSAI	12.70	
					MW-14S	GSAI	36.40	
					MW-16I	GSAI	12.80	
					MW-18I	GSAI	10.00	B
		TOLUENE MONITOR WELL	UG/L	8.00	TMW-01S	GSAI	138.00	
					TMW-02S	GSAI	25.70	
					TMW-03S	GSAI	8.40	B
					TMW-04S	GSAI	13.30	
	CADMIUM	MONITORING WELL	UG/L	4.00	MW-09S	GSAI	8.40	
	CHROMIUM	MONITORING WELL	UG/L	100.00	MW-02	GSAI	442.00	
					MW-06S	GSAI	145.00	
					MW-14S	GSAI	526.00	
					MW-15S	GSAI	844.00	
					MW-16I	GSAI	214.00	
					MW-16S	GSAI	220.00	
					MW-24D	GSAI	139.00	
	COPPER	DUPLICATE	UG/L	1,000.00	MW-16A	GSAI	1,410.00	
		MONITORING WELL	UG/L	1,000.00	MW-14S	GSAI	4,190.00	
					MW-16D	GSAI	1,540.00	
	IRON	DUPLICATE	UG/L	300.00	MW-09A	GSAI	3,220.00	
					MW-12A	GSAI	3,840.00	
					MW-16A	GSAI	83,900.00	
		MONITORING WELL	UG/L	300.00	MW-01	GSAI	7,220.00	
					MW-02	GSAI	32,200.00	
					MW-03DR	GSAI	10,200.00	
					MW-03S	GSAI	22,100.00	
					MW-05DR	GSAI	15,600.00	
					MW-05I	GSAI	396.00	
					MW-05SR	GSAI	12,400.00	
					MW-06DR	GSAI	20,600.00	
					MW-06S	GSAI	8,580.00	
					MW-07D	GSAI	9,990.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
E.METALS	IRON	MONITORING WELL	UG/L	300.00	MW-07S	GSAI	3,830.00	
					MW-08D	GSAI	4,160.00	
					MW-08S	GSAI	52,500.00	
					MW-09D	GSAI	154,000.00	
					MW-09I	GSAI	2,970.00	
					MW-09S	GSAI	13,700.00	
					MW-10D	GSAI	23,400.00	
					MW-10S	GSAI	5,850.00	
					MW-10SA	GSAI	7,040.00	
					MW-11D	GSAI	31,100.00	
					MW-11S	GSAI	8,320.00	
					MW-12I	GSAI	2,050.00	
					MW-12S	GSAI	3,770.00	
					MW-14D	GSAI	9,060.00	
					MW-14I	GSAI	5,460.00	
					MW-14S	GSAI	27,700.00	
					MW-15D	GSAI	14,200.00	
					MW-15I	GSAI	3,480.00	
					MW-15S	GSAI	12,800.00	
					MW-16D	GSAI	96,100.00	
					MW-16I	GSAI	924,000.00	
					MW-16S	GSAI	39,400.00	
					MW-17D	GSAI	2,090.00	
					MW-17I	GSAI	1,080.00	
					MW-17S	GSAI	814.00	
					MW-18D	GSAI	16,900.00	
					MW-18I	GSAI	9,490.00	
					MW-18S	GSAI	2,350.00	
					MW-19	GSAI	24,700.00	
					MW-21	GSAI	45,800.00	
					MW-22	GSAI	12,800.00	
					MW-23	GSAI	9,690.00	
					MW-24D	GSAI	18,100.00	
					MW-24I	GSAI	2,310.00	
					MW-24S	GSAI	1,010.00	
					MW-25D	GSAI	23,600.00	
					MW-25I	GSAI	451.00	
					MW-25S	GSAI	3,150.00	
					MW-26D	GSAI	8,200.00	
					MW-26I	GSAI	510.00	
					MW-26S	GSAI	2,250.00	
		TOLUENE MONITOR WELL	UG/L	300.00	TMW-01S	GSAI	3,870.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
E.METALS	IRON	TOLUENE MONITOR WELL	UG/L	300.00	TMW-02S	GSAI	16,400.00	
					TMW-03S	GSAI	19,000.00	
					TMW-04S	GSAI	28,700.00	
	LEAD	DUPLICATE	UG/L	10.00	MW-16A	GSAI	6,230.00	
		MONITORING WELL	UG/L	10.00	MW-02	GSAI	13.60	
					MW-07S	GSAI	15.30	
					MW-09D	GSAI	10.30	B
					MW-09S	GSAI	95.10	
					MW-10D	GSAI	13.10	
					MW-14S	GSAI	105.00	
					MW-16D	GSAI	6,320.00	
					MW-16I	GSAI	23.50	
					MW-16S	GSAI	19.80	
					MW-18S	GSAI	12.90	
					MW-19	GSAI	10.80	B
					MW-21	GSAI	11.40	
		TOLUENE MONITOR WELL	UG/L	10.00	TMW-01S	GSAI	18.60	
	MANGANESE	DUPLICATE	UG/L	50.00	MW-09A	GSAI	2,090.00	
					MW-12A	GSAI	2,440.00	
					MW-16A	GSAI	20,400.00	
		EQUIPMENT BLANK	UG/L	50.00	RB-971117	GSAI	67.30	
		MONITORING WELL	UG/L	50.00	MW-01	GSAI	2,700.00	
					MW-02	GSAI	619.00	
					MW-03DR	GSAI	86.60	
					MW-03S	GSAI	3,310.00	
					MW-05DR	GSAI	662.00	
					MW-05SR	GSAI	512.00	
					MW-06DR	GSAI	1,040.00	
					MW-06S	GSAI	629.00	
					MW-07D	GSAI	891.00	
					MW-07I	GSAI	173.00	
					MW-07S	GSAI	714.00	
					MW-08D	GSAI	58.80	
					MW-08S	GSAI	6,730.00	
					MW-09D	GSAI	1,240.00	
					MW-09I	GSAI	1,960.00	
					MW-09S	GSAI	2,090.00	
					MW-10D	GSAI	1,010.00	
					MW-10S	GSAI	3,040.00	
					MW-10SA	GSAI	560.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
E.METALS	MANGANESE	MONITORING WELL	UG/L	50.00	MW-11D	GSAI	783.00	
					MW-11S	GSAI	1,180.00	
					MW-12D	GSAI	454.00	
					MW-12I	GSAI	8,170.00	
					MW-12S	GSAI	2,420.00	
					MW-14D	GSAI	656.00	
					MW-14I	GSAI	1,550.00	
					MW-14S	GSAI	889.00	
					MW-15D	GSAI	917.00	
					MW-15I	GSAI	1,820.00	
					MW-15S	GSAI	653.00	
					MW-16D	GSAI	23,600.00	
					MW-16I	GSAI	20,900.00	
					MW-16S	GSAI	54.90	
					MW-17D	GSAI	1,070.00	
					MW-17I	GSAI	1,550.00	
					MW-17S	GSAI	470.00	
					MW-18D	GSAI	434.00	
					MW-18I	GSAI	5,040.00	
					MW-18S	GSAI	504.00	
					MW-19	GSAI	2,880.00	
					MW-21	GSAI	1,020.00	
					MW-22	GSAI	1,280.00	
					MW-23	GSAI	264.00	
					MW-24D	GSAI	76.90	
					MW-24I	GSAI	191.00	
					MW-24S	GSAI	55.40	
					MW-25D	GSAI	215.00	
					MW-25S	GSAI	316.00	
					MW-26D	GSAI	289.00	
					MW-26I	GSAI	640.00	
					MW-26S	GSAI	1,250.00	
		TOLUENE MONITOR WELL	UG/L	50.00	TMW-01S	GSAI	214.00	
					TMW-02S	GSAI	3,950.00	
					TMW-03S	GSAI	2,560.00	
					TMW-04S	GSAI	1,230.00	
	NICKEL	MONITORING WELL	UG/L	100.00	MW-10D	GSAI	151.00	
					MW-16I	GSAI	106.00	
					MW-17D	GSAI	110.00	
					MW-17I	GSAI	114.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE		AMOUNT	Q
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NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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EXCEEDANCES OF NJDEP GROUND WATER QUALITY STANDARDS (GWQS)
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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
E.METALS	SODIUM	DUPLICATE	UG/L	50,000.00	MW-16A	GSAI	162,000.00	
		MONITORING WELL	UG/L	50,000.00	MW-01	GSAI	85,600.00	
					MW-02	GSAI	64,400.00	
					MW-03S	GSAI	58,300.00	
					MW-05DR	GSAI	62,900.00	
					MW-05SR	GSAI	264,000.00	
					MW-06DR	GSAI	93,900.00	
					MW-06S	GSAI	567,000.00	
					MW-07D	GSAI	77,900.00	
					MW-07I	GSAI	240,000.00	
					MW-07S	GSAI	950,000.00	
					MW-08S	GSAI	120,000.00	
					MW-09D	GSAI	76,400.00	
					MW-09I	GSAI	286,000.00	
					MW-09S	GSAI	391,000.00	
					MW-10D	GSAI	153,000.00	
					MW-10S	GSAI	122,000.00	
					MW-10SA	GSAI	166,000.00	
					MW-11D	GSAI	69,300.00	
					MW-14D	GSAI	63,800.00	
					MW-14I	GSAI	186,000.00	
					MW-14S	GSAI	87,400.00	
					MW-15D	GSAI	121,000.00	
					MW-15I	GSAI	164,000.00	
					MW-15S	GSAI	51,400.00	
					MW-16D	GSAI	155,000.00	
					MW-16I	GSAI	107,000.00	
					MW-17D	GSAI	144,000.00	
					MW-17I	GSAI	111,000.00	
					MW-18I	GSAI	113,000.00	
					MW-19	GSAI	154,000.00	
					MW-21	GSAI	1,160,000.00	
					MW-22	GSAI	471,000.00	
					MW-24S	GSAI	250,000.00	
					MW-25S	GSAI	97,800.00	
					MW-26S	GSAI	87,600.00	
		TOLUENE MONITOR WELL	UG/L	50,000.00	TMW-01S	GSAI	492,000.00	
					TMW-02S	GSAI	296,000.00	
					TMW-03S	GSAI	166,000.00	
					TMW-04S	GSAI	234,000.00	
	THALLIUM	DUPLICATE	UG/L	10.00	MW-16A	GSAI	65.80	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
E.METALS	THALLIUM	MONITORING WELL	UG/L	10.00	MW-08S	GSAI	28.50	
					MW-12I	GSAI	11.80	
					MW-16D	GSAI	74.00	
					MW-16I	GSAI	54.20	
					MW-19	GSAI	10.80	B
	ZINC	DUPLICATE	UG/L	5,000.00	MW-16A	GSAI	83,400.00	
		MONITORING WELL	UG/L	5,000.00	MW-16D	GSAI	91,000.00	

NOTE: CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.

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GROUP	PARAMETER	AREA	UNITS	NJDEP GWQS	SAMPLE	--	AMOUNT	Q
H.MISC GW	CHLORIDE	MONITORING WELL	MG/L	250.00	MW-05SR	GSAI	403.00	
	SULFATE	MONITORING WELL	MG/L	250.00	MW-07S	GSAI	533.00	

NOTE: *CONCENTRATIONS SHOWN REPRESENT TOTAL METALS. DISSOLVED METALS DETECTED ARE SHOWN ON THE NOVEMBER 1997 COMPREHENSIVE ANALYTICAL RESULTS TABLES.*

plant operations. Naphthalene was detected at a concentration of 70 µg/l in MW-5SR. This result is consistent with the January 1996 sampling event. This naphthalene detection does not appear on Plate 3, because the GWQS of 30 µg/l for naphthalene was not adopted at the time this figure was originally submitted to the Department.

4.4.3.3 *Metals*

During this sampling event, both filtered and unfiltered samples were collected to evaluate the effect of aquifer turbidity on analytical results.

One or more metals were detected in the unfiltered and filtered samples collected from each of the monitoring wells. Concentrations of metals detected in the unfiltered samples are consistent with the January 1996 ground water analytical results. The distribution and similar total concentrations of four metals: aluminum, iron, manganese, and sodium, along with respective dissolved metals results indicate that these metals are naturally occurring. Significantly lower concentrations of aluminum, iron, and manganese were typically detected in dissolved form, indicating that the concentrations reported for total metals samples were indeed related to suspended solids. The concentrations of sodium detected in dissolved metals samples were similar to those detected in total metals samples.

Consistent with the January 1996 data, several additional metals were detected in wells in, or downgradient of identified source areas. The occurrence of these metals may be attributable to leaching of inorganic constituents in these localized areas. Metals other than the four listed above generally occurred coincidentally with AOCs identified for organic constituents.

4.4.4 *November 1997, February 1998 and May 1998 Analytical Results*

The following section summarizes the analytical results obtained during the November 1997 ground water sampling event. Organic and total inorganic constituents detected at concentrations exceeding the GWQS are summarized in Table 4-5, and Plates 4, 5 and 6. Data summary and comprehensive tables of the detected organic and inorganic constituents are provided in Appendix H.

It should be noted that monitoring wells MW-20, MW-27D, MW-28D, MW-29D were not sampled concurrent with the other wells, as their installation postdated the November sampling event. Well MW-20 was sampled in February 1998. Wells MW-27D, 28D, and 29D were sampled in May 1998. However, data from these wells are included herein with the November data for comparison purposes. However, comparisons between these wells sampled during different time periods should be considered qualitatively when compared to the November data.

4.4.4.1 *Volatile Organic Compounds*

Consistent with the previous sampling results, TCE was the only VOC detected above the GWQS in the northwestern perimeter wells. Of these wells, TCE was only detected in MW-3DR at an estimated concentration of 9 µg/l. As previously discussed, the detection of TCE in MW-3DR may be related to the VOCs detected in the in-situ ground water sample from PSD-02.

The VOCs detected in the Interior and Downgradient Wells were generally consistent with those detected in March 1997, although generally higher. The consistent increase in VOC concentrations across the site is presumably a seasonally artifact of significantly lower ground water elevations (i.e. less dilution). In some cases, concentrations of individual VOCs have decreased slightly, potentially as a result of natural degradation. Based on the available ground water data, confirmation of any concentration trends is not possible given the impact of seasonal ground water fluctuations. Continued sampling over the longer term will aid in determining any concentration trends. Interestingly, the toluene concentration in MW-6S fell to below the GWQS from its original concentration of 34,000 µg/l in March 1997.

The concentration of TCE in well MW-21 supports the ground water analytical result from boring PSD-02 in suggesting a potential localized source area for chlorinated VOCs.

Data from the recently installed downgradient offsite wells show that 1,2-DCA is the only VOC present at concentrations above the GWQS. No 1,2-DCA was present in the downgradient offsite shallow overburden monitoring wells (MW-24S, MW-25S, and MW-26S). Two of the deep overburden monitoring wells (MW-24I and MW-26I), screened at overburden-bedrock interface, had 1,2-DCA present at concentrations of 16 and 10 µg/l, respectively. No 1,2-DCA was detected in bedrock monitoring wells located northeast (MW-27D and MW-29D) and southeast (MW-26D) of the site. However, 1,2-DCA was detected in wells directly east of the site, with a maximum concentration of 2,100 µg/l detected in MW-24D.

4.4.4.2 *Semi-Volatile Organic Compounds*

SVOCs were detected above the GWQS in only 3 of the 61 site monitoring wells. Detected concentrations of naphthalene (99 μg/l) in MW-5SR and Pentachlorophenol (3 μg/l) in MW-2 are consistent with prior sampling results. Recently installed MW-22 also contains naphthalene at a low concentration.

4.4.4.3 *Metals*

One or more metals were detected in the unfiltered and filtered samples collected from each of the monitoring wells. Concentrations of metals detected are consistent with previously reported ground water results. The distribution and similar total concentrations of four metals: aluminum, iron, manganese, and sodium, along with their respective dissolved metals results suggest that these metals are naturally occurring. Significantly lower concentrations of aluminum, iron, and manganese were typically detected in the dissolved state, indicating that the concentrations reported for total metals samples were influenced by suspended solids. The concentrations of sodium detected in dissolved metals samples were similar to those detected in total metals samples.

Consistent with the January 1996 and March 1997 data, several other metals were detected in wells in, or downgradient of identified source areas. The occurrence of these metals is likely attributable to leaching of inorganic constituents in these localized areas. Metals other than the four listed above generally occurred coincidentally with AOCs identified for organic constituents. These metals include: lead, zinc, copper, nickel, chromium, and arsenic; all of which are strongly associated with iron- and/or manganese-oxides. Although concentrations of these metals are above the GWQS in unfiltered samples from some wells, in the associated filtered samples they are typically below the GWQS. The lack of significant occurrence of these metals in the filtered samples relative to unfiltered samples corresponds with significantly lower iron and manganese concentrations in the unfiltered samples. This suggests that these metals are generally not present in the dissolved state, and that their occurrence is limited by the abundance of suspended iron- and manganese-oxides in most of the affected wells (e.g. MW-9D, MW-9S, MW-10D, MW-12I, MW-14S, MW-15S, MW-16D, MW-16I, MW-16S, MW-18S, and MW-21).

Recently installed monitoring well nest 16, located immediately downgradient of the former spent acid pit, provides direct evidence of the leaching of inorganic constituents. As expected, unfiltered samples from these wells contain the highest concentrations of several inorganic constituents. The concentration of lead (6,320 µg/l) in MW-16D is more than 60 times greater than anywhere else onsite. This elevated concentration appears to be localized, as metals in the surrounding wells (MW-11D, MW-17D) and wells determined to be immediately downgradient (MW-10D, MW-24D) are generally present at what are interpreted to be naturally occurring concentrations. Except for manganese, sodium, and iron, no metals exceed the GWQS in filtered samples from well nest 16, and the concentrations of iron and manganese are one to four orders of magnitude lower than in their associated unfiltered samples. Because the mobility of iron and manganese is low except in acidic and reducing environments, these data suggest that iron and manganese were leached in the vicinity of the spent acid pit and precipitated downgradient where the water became less acid. This geochemical behavior is particularly significant in consideration of the composition of the native soil and bedrock. The Brunswick Formation is a very iron rich formation (hence red color). Other dissolved metals presumably coprecipitated with these (e.g. Ni and Cu) or were adsorbed onto the surfaces of the solid phase iron- and manganese-oxides (e.g. Pb, Zn, Cu, and Cr).

4.5 *GEOLOGY/HYDROGEOLOGY*

A detailed discussion of the regional geology and hydrogeology is provided in Section 2 and will not be discussed in detail in this section. Thus, the discussion in this section is a summary of the site-specific geology and hydrogeology developed from the data collected during the Phase II RIGW and Phase III RI.

4.5.1 *Site Geology*

Conclusions regarding the site geology were derived from a comprehensive review of the Phase I, Phase II and Phase III subsurface investigations. The data used in the interpretation of these units was collected from tank excavations, soil borings, monitoring well installations, and borehole geophysics. Soil boring and well logs from the Phase I and Phase II investigations are presented in the reports entitled *Revised Draft Remedial Investigation Report* (ERM, 1991), *Remedial Investigation Report for Soils* (ERM, October 1997) and *Phase II Remedial Investigation for Ground Water* (ERM, March 1997). Soil boring logs from the Phase III RI are presented in Appendix D.

Two geologic units (overburden and bedrock) were encountered during the comprehensive subsurface activities to date. The unconsolidated overburden at the site consists of stratified sand, gravel, silt, and some clay (Plate 7). The occurrence of significant clay units generally increases towards the central and south-central portions of the site. The overburden at the site ranges in thickness from approximately 80 feet at the northwestern corner of the site (MW-3DR) to approximately 154 feet at the eastern corner of the site (MW-10D.) As shown in Figure 4-7, the bedrock topography slopes down to a trough oriented along a northeast trending axis with the deepest portion running through monitoring well MW-10D. South of the site perimeter, the bedrock topography slopes upward towards the Passaic River.

Bedrock fractures were encountered in most of the deep wells. The yield from the fractures ranged from several gallons per minute (gpm) to over 100 gpm. The highest yields were observed in wells MW-12D and MW-24D.

Grain size generally decreases with depth across the site. Surficial sediments and shallow subsurface sediments (approximately 0 to 25 feet below grade) are typically composed of varying textures of sand and gravel. A fining downward sequence consisting of fine grained sand to silt was typically encountered as the borings approached the water table. Below the water table, an increase in the frequency of interbedded clay and silt layers was generally observed. A clay rich saprolitic layer was typically encountered immediately above the bedrock surface; however, in some areas coarse gravel was found overlying the bedrock surface (Plate 7).

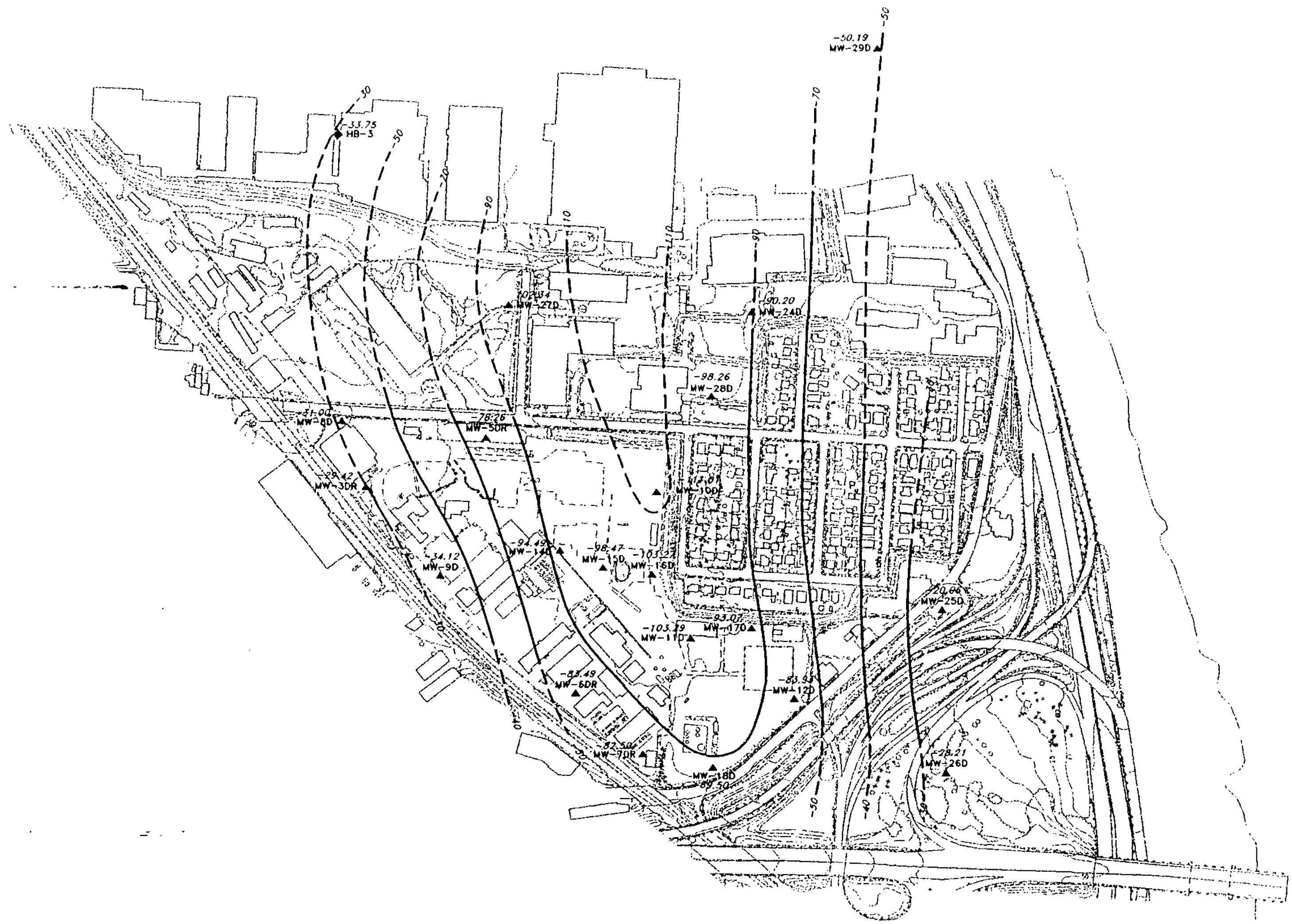
4.5.2 *Site Hydrogeology*

Conclusions regarding the site hydrogeology were derived from Phase I and Phase II water level measurements, multiple Phase III water level rounds, and qualitative water level data obtained from borings completed during the Phase II RIS.

Two aquifers are being monitored by the site well network: the shallow and intermediate wells monitor the unconsolidated overburden aquifer while the deep wells monitor the shallow bedrock aquifer. Based on consistent differing water levels, and the behavior of the well during evacuation, it has been concluded that monitoring well MW-10SA monitors a localized perched zone.

Figures 4-8 through 4-14 show the interpreted overburden aquifer potentiometric surface for all of the comprehensive water level rounds collected to date. Figures 4-15 through 4-21 show the corresponding bedrock aquifer ground water elevations. The following sections discuss the hydrogeologic characteristics of each aquifer. Values for aquifer

Figure 4-7
Bedrock Topography Map
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

▲ Monitoring Well Location (Deep)

◆ Hydropunch Boring Location (Source: RAR for Certified Metals Co., February 1998)

-83.93 Bedrock Elevation (Feet, AMSL)

——-90—— Bedrock Elevation Contour (Feet, AMSL) (Dashed Where Inferred)

N

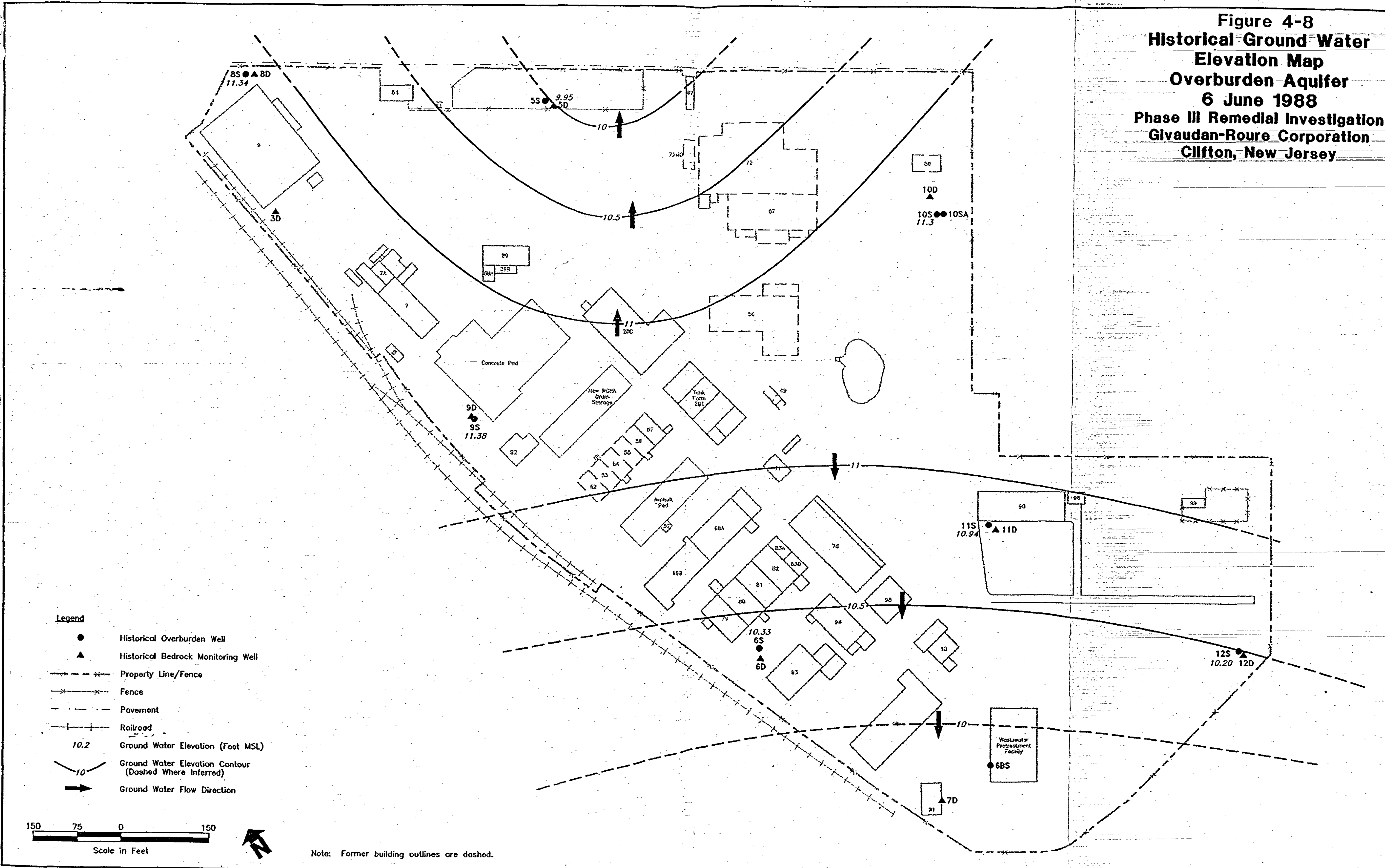
400 200 0 400

Scale in Feet

ERM

22321.20.01/06.10.98-MKB/07.01.98-MKB/A203-1C

Figure 4-8
Historical Ground Water Elevation Map
Overburden Aquifer
6 June 1988
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Note: Former building outlines are dashed.

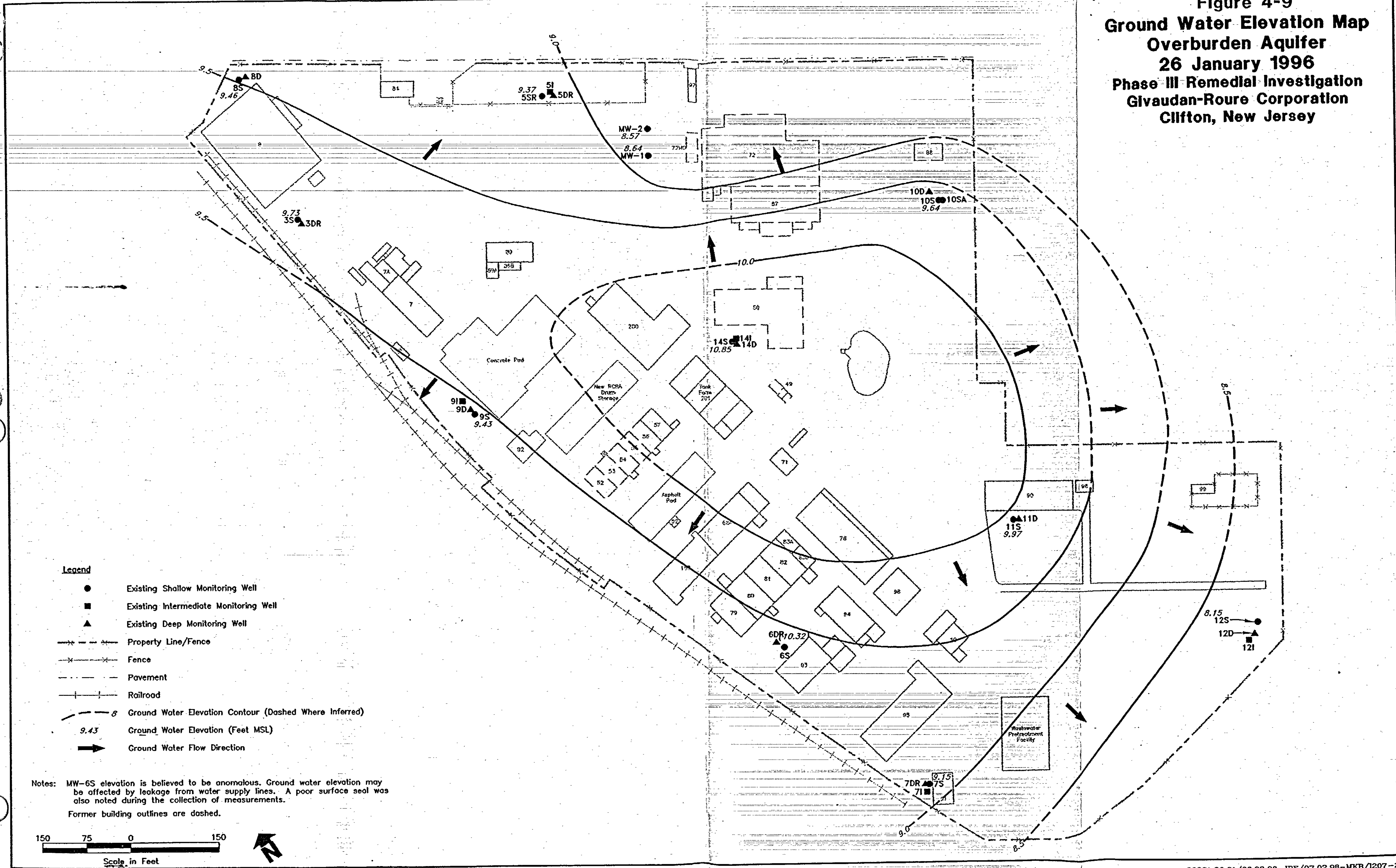
ERM

22321.20.01/06.03.98-JRE/07.02.98-MKB/I209-1C

932790240

932790241

Figure 4-9
Ground Water Elevation Map
Overburden Aquifer
26 January 1996
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



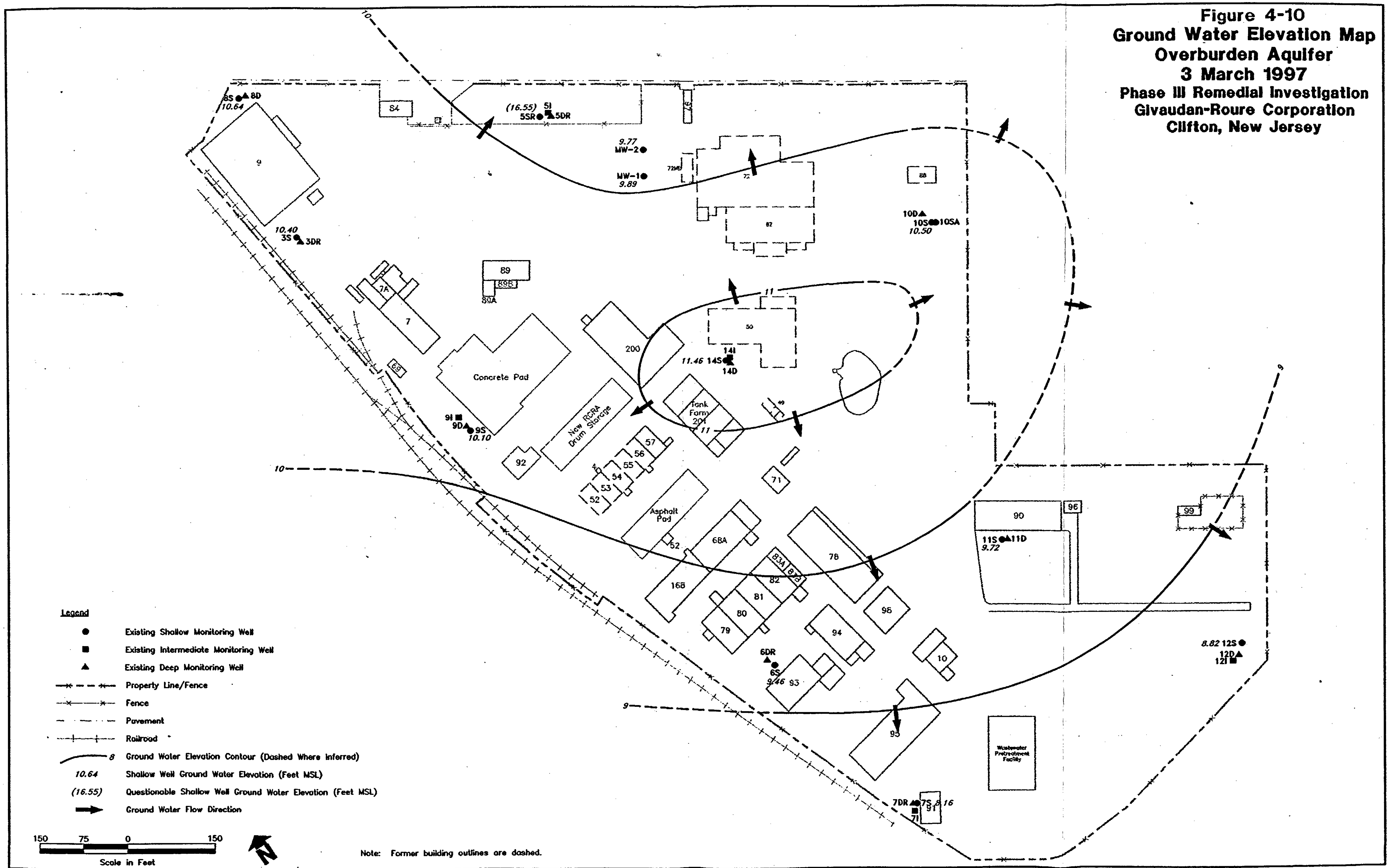
Notes: MW-6S elevation is believed to be anomalous. Ground water elevation may be affected by leakage from water supply lines. A poor surface seal was also noted during the collection of measurements.

Former building outlines are dashed.

ERM

22321.20.01/06.03.98-JRE/07.02.98-MKB/1207-2C

Figure 4-10
Ground Water Elevation Map
Overburden Aquifer
3 March 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



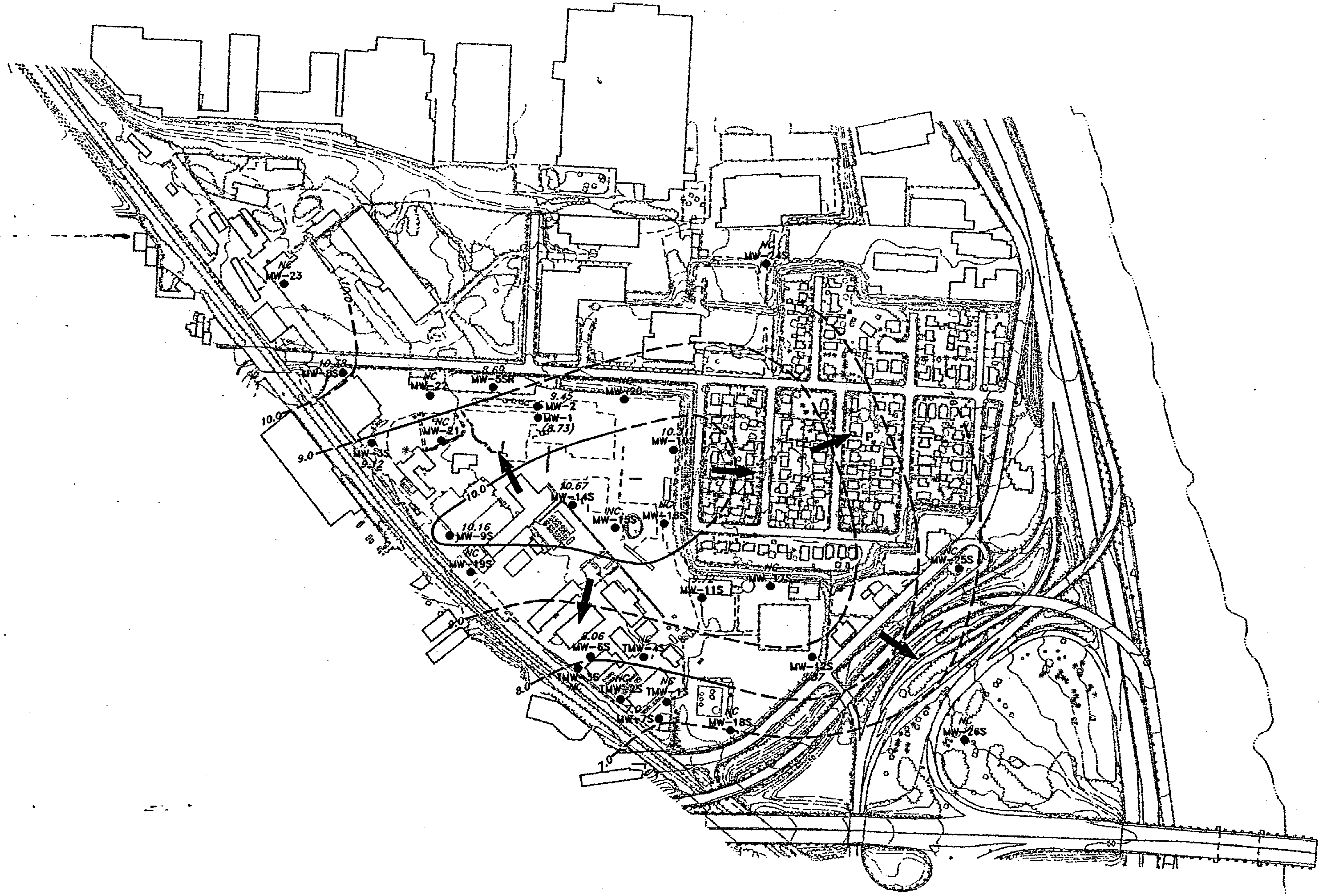
Note: Former building outlines are dashed.

ERM

22321.20.01/07.01.98-MKB/1216-1C

932790242

Figure 4-11
Ground Water Elevation Map
Overburden Aquifer
9 June 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

●	Monitoring Well Location (Shallow)
8.69	Ground Water Elevation (Feet, AMSL)
—*8.0*—	Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
➔	Ground Water Flow Direction
(8.73)	Questionable Ground Water Elevation
NC	Not Constructed Prior to Water Level Measurement

N

400 200 0 400

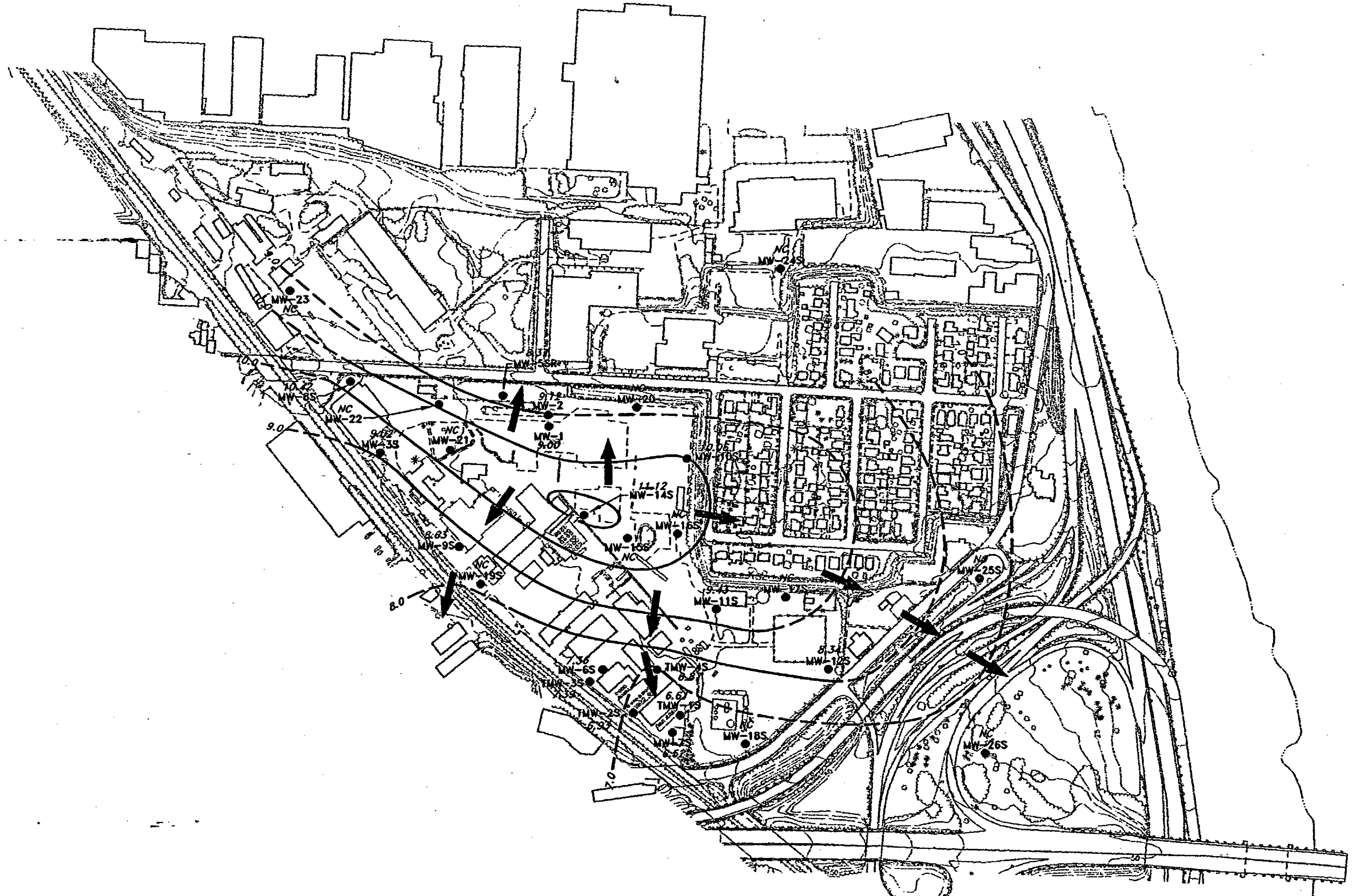
Scale in Feet

ERM

22321.20.01/06.10.98-MKB/07.01.98-MKB/A202-1C

932790243

Figure 4-12
Ground Water Elevation Map
Overburden Aquifer
11 August 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

●	Monitoring Well Location (Shallow)
9.43	Ground Water Elevation (Feet, AMSL)
—9.0—	Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
➡	Ground Water Flow Direction
NC	Not Constructed Prior to Water Level Measurement

400 200 0 400

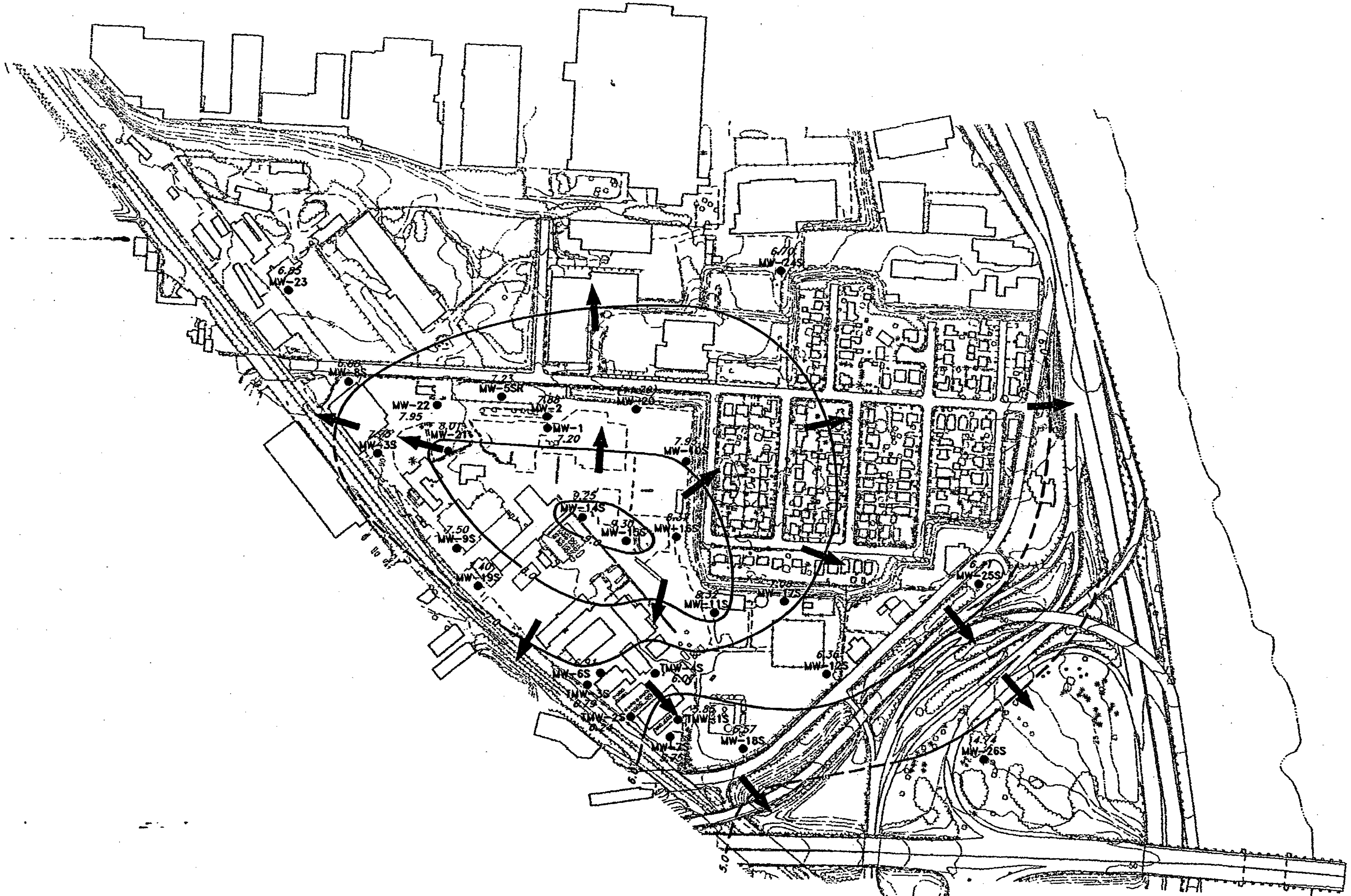
Scale in Feet

ERM

22321.20.01/07.01.98-MKB/A208-1C

932790244

Figure 4-13
Ground Water Elevation Map
Overburden Aquifer
17 November 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

- ● Monitoring Well Location (Shallow)
- 6.36 Ground Water Elevation (Feet, AMSL)
- —7.0— Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
- Ground Water Flow Direction
- (11.70) Questionable Ground Water Elevation

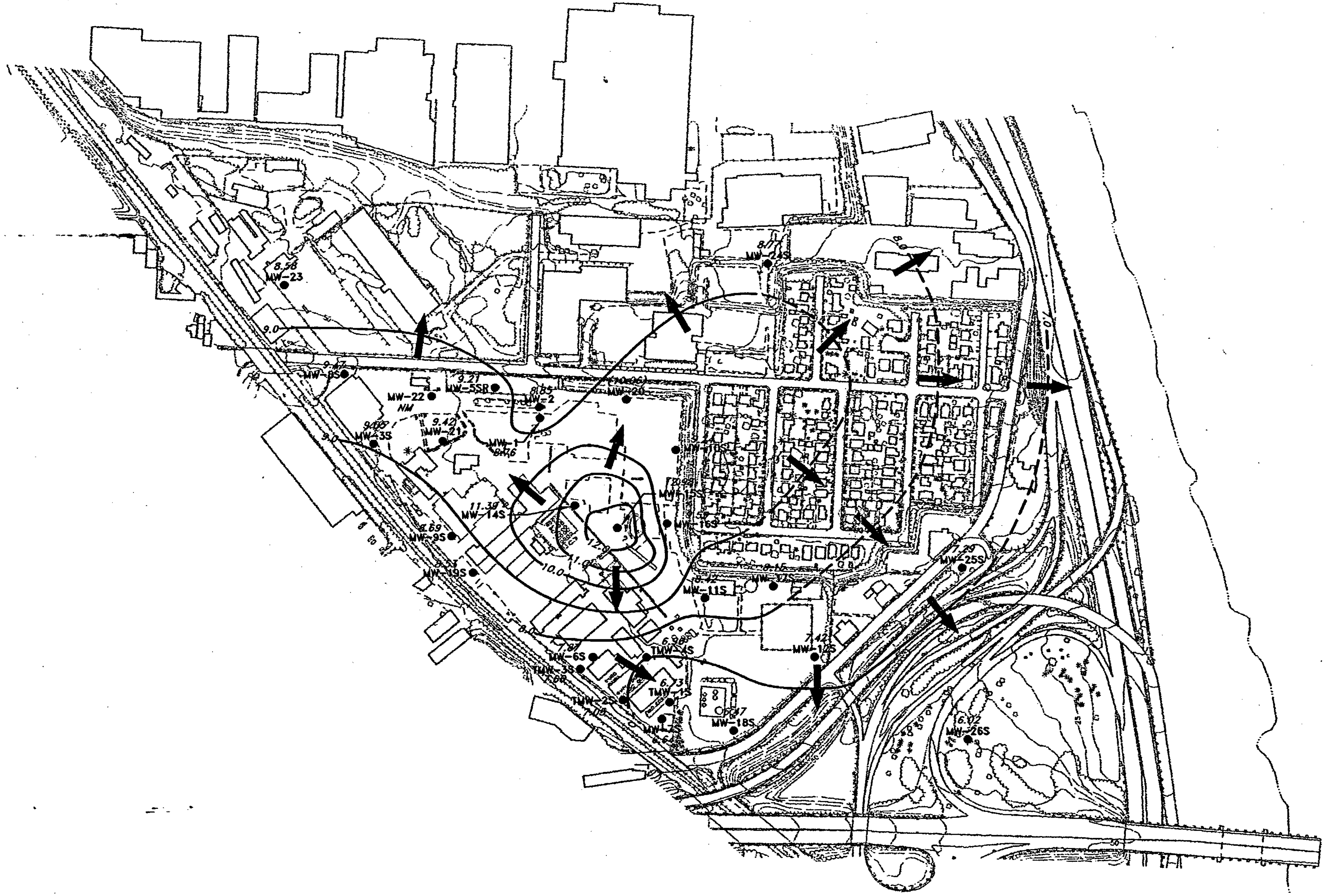
400 200 0 400
Scale in Feet

ERM

22321.20.01/07.01.98-MKB/A207-1C

932790245

Figure 4-14
Ground Water Elevation Map
Overburden Aquifer
13 May 1998
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

- ● Monitoring Well Location (Shallow)
- *8.15* Ground Water Elevation (Feet, AMSL)
- —8.0— Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
- ➡ Ground Water Flow Direction
- *(10.06)* Questionable Ground Water Elevation
- *NM* Not Measured

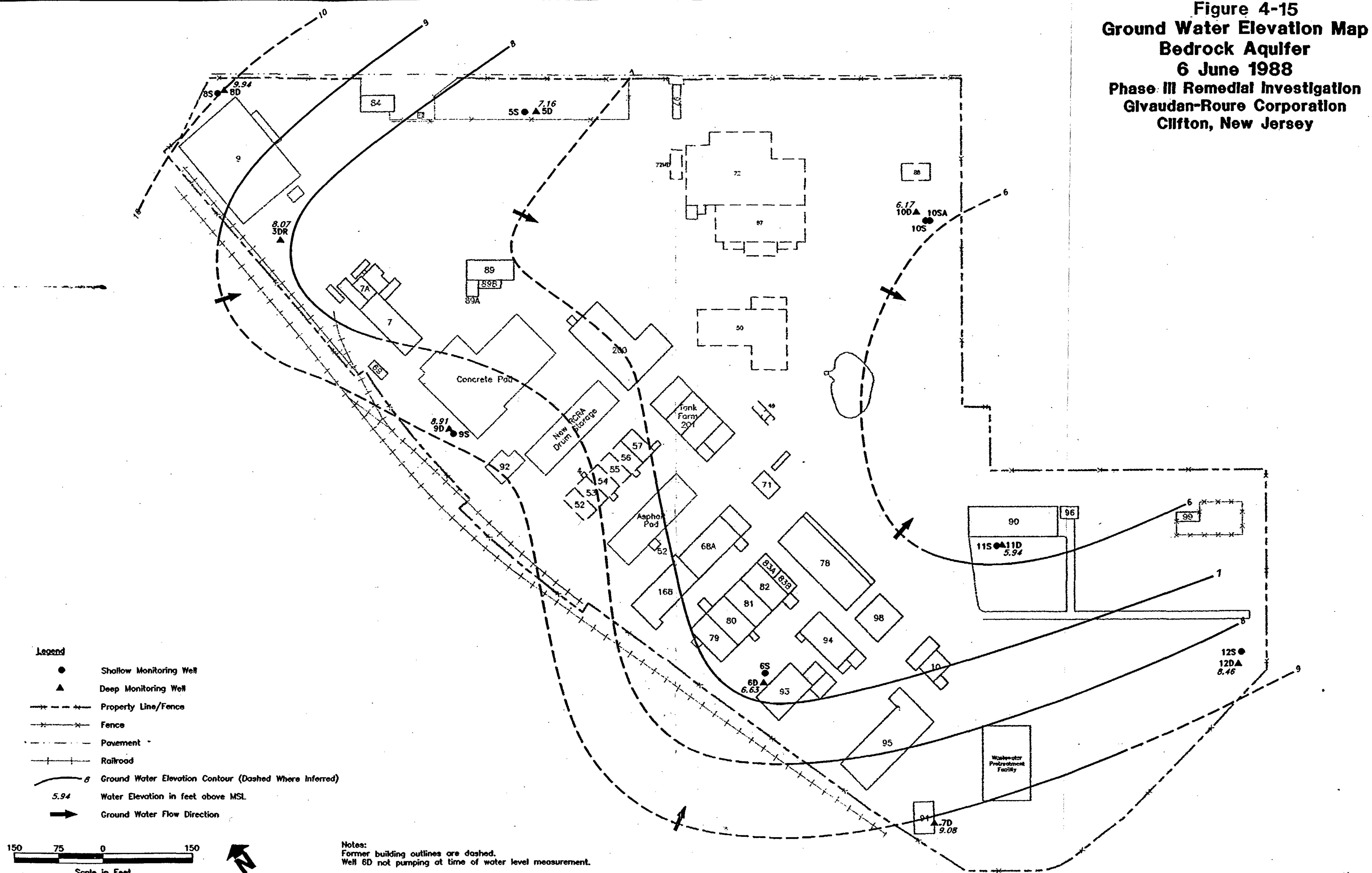
400 200 0 400
Scale in Feet

ERM

22321.20.01/07.01.98-MKB/A208-1C

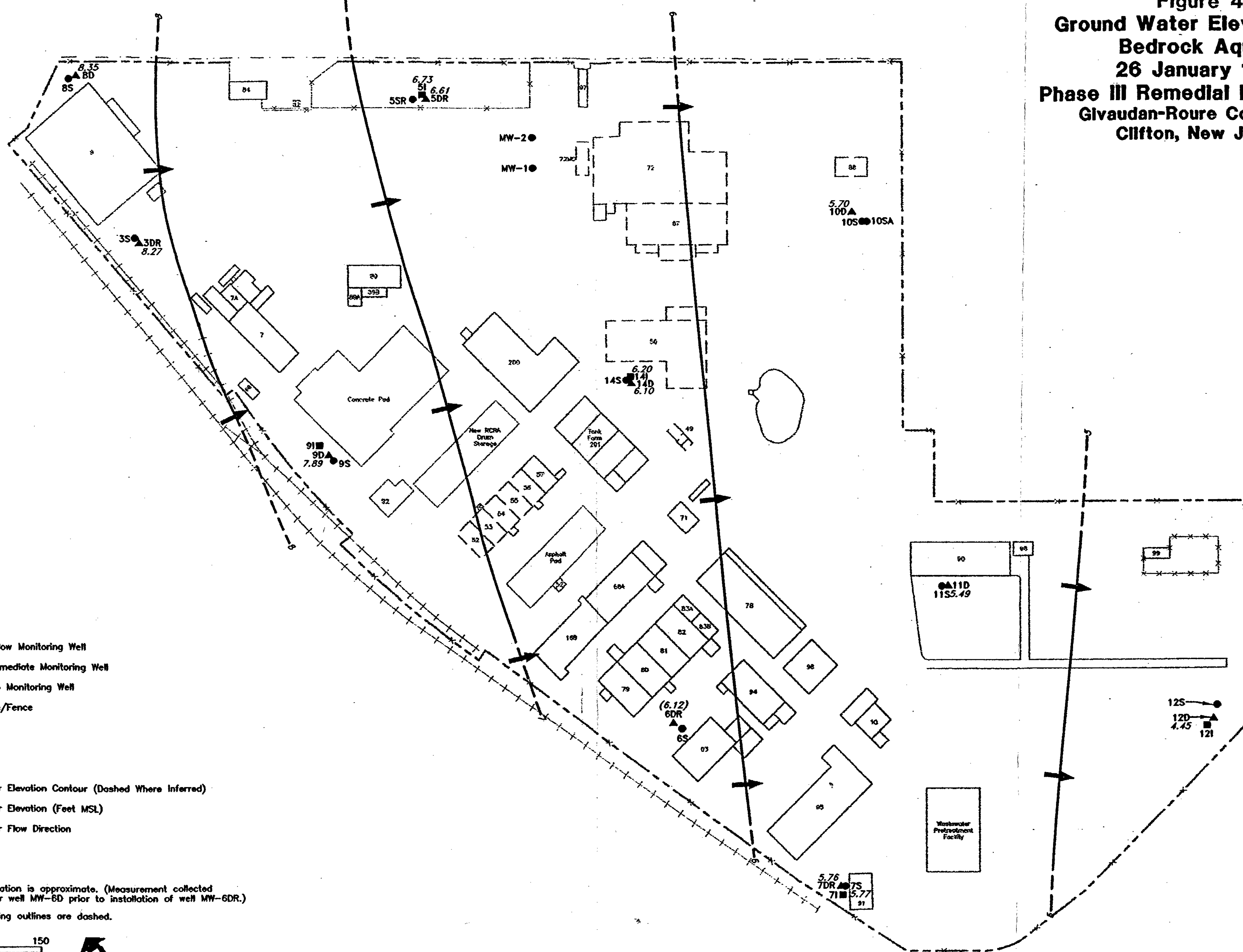
932790246

Figure 4-15
Ground Water Elevation Map
Bedrock Aquifer
6 June 1988
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Notes:
Former building outlines are dashed.
Well 6D not pumping at time of water level measurement.

Figure 4-16
Ground Water Elevation Map
Bedrock Aquifer
26 January 1996
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

- ● Existing Shallow Monitoring Well
- ■ Existing Intermediate Monitoring Well
- ▲ Existing Deep Monitoring Well
- Property Line/Fence
- Fence
- Pavement
- Railroad
- 8 Ground Water Elevation Contour (Dashed Where Inferred)
- 7.89 Ground Water Elevation (Feet MSL)
- Ground Water Flow Direction

Notes: MW-6DR elevation is approximate. (Measurement collected from former well MW-6D prior to installation of well MW-6DR.)
Former building outlines are dashed.

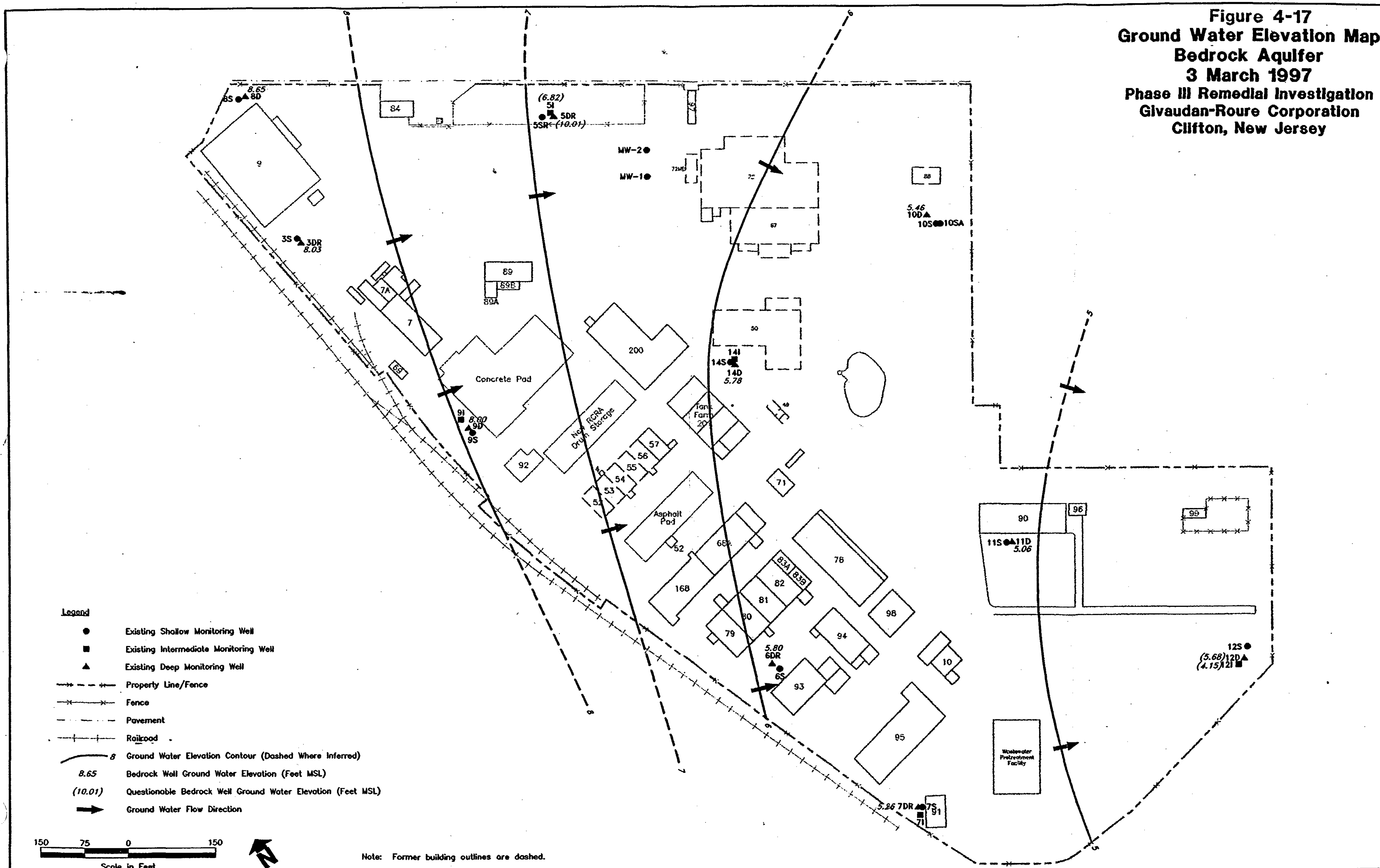
150 75 0 150
Scale in Feet

N

ERM

22321.20.01/06.03.98-JRE/07.02.98-MKB/1207-1C

Figure 4-17
Ground Water Elevation Map
Bedrock Aquifer
3 March 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



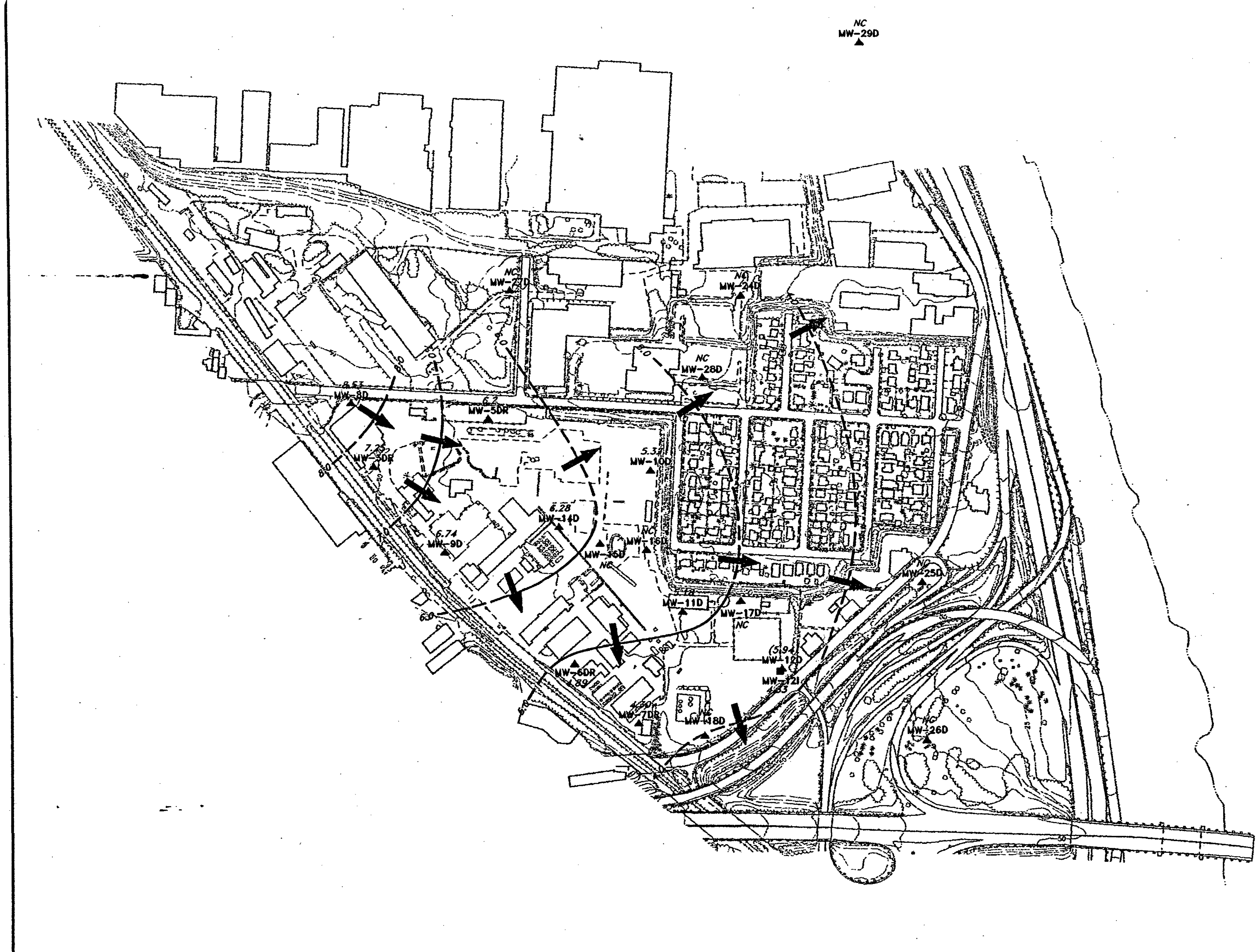
Note: Former building outlines are dashed.

ERM

22321.20.01/07.02.98-MKB/1215-1C

932790249

Figure 4-18
Ground Water Elevation Map
Bedrock Aquifer
9 June 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

■	Monitoring Well Location (Intermediate)
▲	Monitoring Well Location (Deep)
5.32	Ground Water Elevation (Feet, AMSL)
—5.0—	Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
➡	Ground Water Flow Direction
(5.94)	Questionable Ground Water Elevation
NC	Not Constructed Prior to Water Level Measurement

N

400 200 0 400

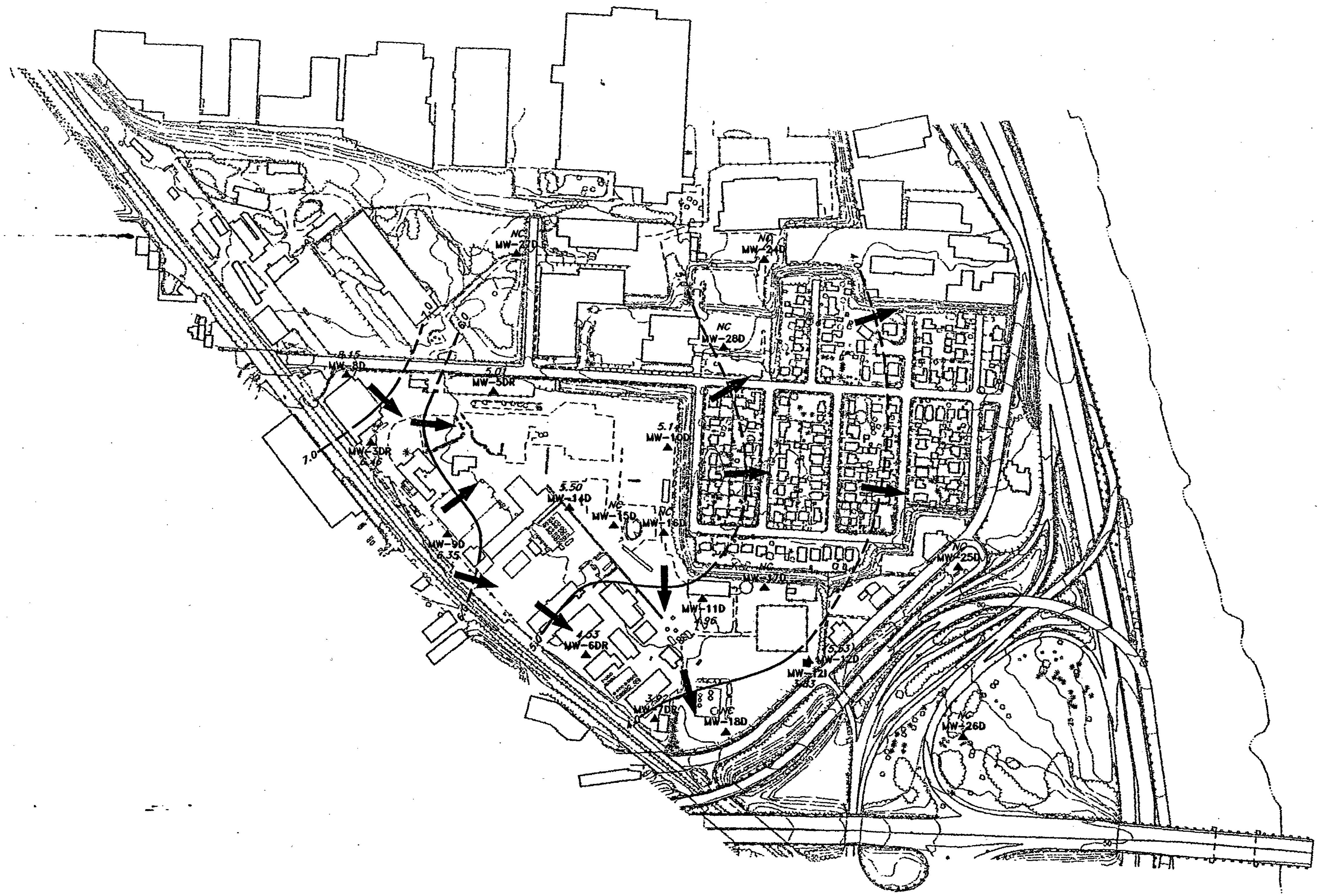
Scale in Feet

22321.20.01/07.02.98-MKB/A211-1C

ERM

932790250

Figure 4-19
Ground Water Elevation Map
Bedrock Aquifer
11 August 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

■	Monitoring Well Location (Intermediate)
▲	Monitoring Well Location (Deep)
5.14	Ground Water Elevation (Feet, AMSL)
—*5.0*—	Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
➔	Ground Water Flow Direction
(5.53)	Questionable Ground Water Elevation
NC	Not Constructed Prior to Water Level Measurement

N

400 200 0 400

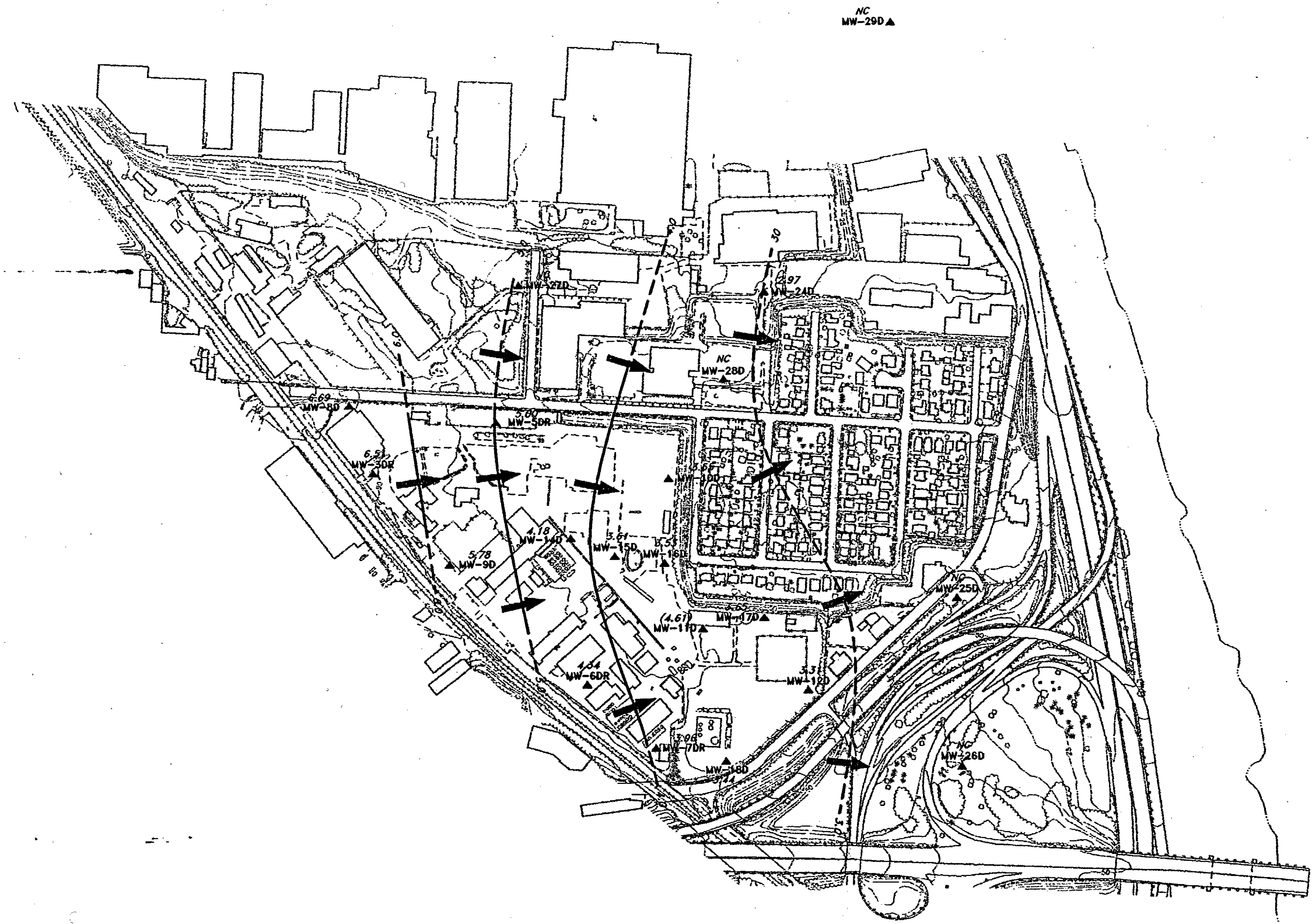
Scale in Feet

ERM

22321.20.01/06.24.98-MKB/A205-1C

932790251

Figure 4-20
Ground Water Elevation Map
Bedrock Aquifer
17 November 1997
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

▲	Monitoring Well Location (Deep)
3.55	Ground Water Elevation (Feet, AMSL)
—*4.0*—	Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)
➡	Ground Water Flow Direction
(4.61)	Questionable Ground Water Elevation
NC	Not Constructed Prior to Water Level Measurement

N

400 200 0 400

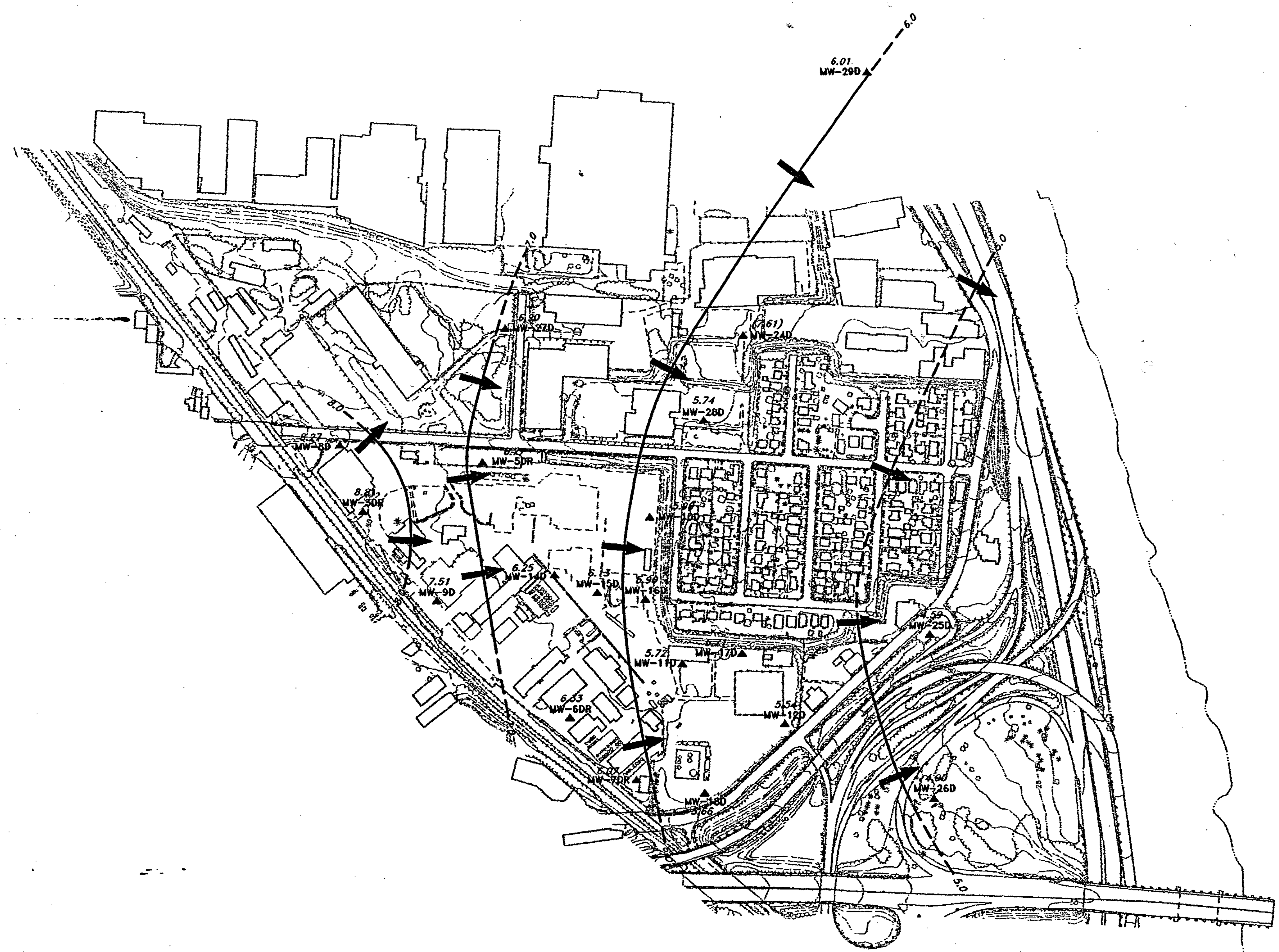
Scale in Feet

ERM

22321.20.01/07.01.98-MKB/A209-1C

932790252

Figure 4-21
Ground Water Elevation Map
Bedrock Aquifer
13 May 1998
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



Legend

▲ Monitoring Well Location (Deep)

5.90 Ground Water Elevation (Feet, AMSL)

—*8.0*— Ground Water Elevation Contour (Feet, AMSL) (Dashed Where Inferred)

➡ Ground Water Flow Direction

(7.61) Questionable Ground Water Elevation

N

400 200 0 400

Scale in Feet

ERM

22321.20.01/07.01.98-MKB/A210-3C

932790253

parameters discussed below were determined during the Phase I RI. A discussion of the calculations used in determining the aquifer characteristics is provided in the report entitled *Revised Draft Remedial Investigation Report* (ERM, September 1991).

4.5.2.1 *Overburden Aquifer*

Ground water in the shallow overburden aquifer occurs under water table conditions. A large portion of the site is covered by asphalt and buildings. Storm water and surface runoff from the plant discharge to the unlined storm water retention pond near Building 50. Historically, the storm water retention pond has always contained some quantity of water, and based on information provided by Givaudan-Roure, is unlined. To control runoff during rain events, overland flow is diverted into the retention pond increasing the amount of water in that facility. The storm water retention pond thus serves as a point of continuous recharge for the shallow aquifer at the site, as water readily infiltrates into the shallow aquifer. Evidence of the recharge from this pond is provided by the measured shallow ground water elevations and unusually shallow water levels observed in soil borings conducted in its vicinity. As demonstrated by the 4-8 through 4-14, recharge creates a ground water mounding effect on the ground water table in the shallow aquifer. These figures show that the size and extent of the ground mound varies, but the general impact on the shallow ground water flow direction is consistent.

A ground water divide is observed in the overburden aquifer along a northwest to southeast trending axis through the former Building 50 area. The installation of well nest 14 in 1994, qualitative water levels interpreted from soil borings advanced during the RIS, and subsequent water level measurements have confirmed the interpreted ground water divide. The mounding effect from the pond causes ground water in the shallow aquifer to flow radially away from the pond and creates the ground water divide by influencing the ground water flow at the northwestern portion of the site. The axis of the interpreted ground water divide is consistent with the location of storm water lines in this area. Thus, potential leaks from the storm water line feeding the pond from the northwest may enhance the mounding effect and cause it to become elongated along a northwest-southeast trending axis.

Horizontal hydraulic gradients in the unconsolidated overburden aquifer typically range from 0.0002 on the northwest portion of the site to 0.0064 in the area around former Building 50 near the storm water retention pond. In the well nests in the overburden aquifer, the ground water elevations measured in the shallow wells were higher than those measured in the intermediate wells. This difference in hydraulic head

Table 4-6
Overburden Aquifer Hydraulic Conductivity Values
June 1988 Slug Testing
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Well Number	Hydraulic Conductivity (ft/sec)
5S	1.67×10^{-4}
6S	1.67×10^{-3}
8S	2.30×10^{-5}
9S	1.67×10^{-4}
10S	9.88×10^{-6}
10SA	5.47×10^{-6}
11S	4.68×10^{-4}
12S	4.00×10^{-4}

Ta[illegible]4-7
Bedrock Aquifer Transmissivity and Storativity Values
June 1988 Well 6D Pumping Test
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Well Number	Drawdown (ft)	Elapsed Time (days)	w(u)	1/u	Pumping Rate GPD	Radius (ft)	Transmissivity gpd/ft	Storativity
6-D	0.78	7.8×10^{-5}	1	10	277920	NA	28500.22	NA
9-D	0.40	0.0174	1	10	277920	674	55554.31	0.00850
11-D	1.12	0.0619	1	10	277920	472	19711.38	0.00220
5-D	1.33	0.2464	1	10	277920	1018.4	16585.05	0.00158
10-D	0.93	0.0325	1	10	277920	814	23696.74	0.00047
7-D	0.93	0.0438	1	10	277920	364	23862.94	0.00316
12-D	0.51	0.0270	1	10	277920	804	43111.44	0.00072

NA = Not Applicable

indicates that a downward vertical gradient exists in the unconsolidated overburden aquifer, and that the shallow overburden water recharges the deeper zones on site.

Slug tests were performed on the unconsolidated overburden aquifer in 1988 during the Phase I RI to establish aquifer characteristics. Hydraulic conductivity (k) values in the overburden aquifer calculated from the test results ranged from 9.88×10^{-6} ft/sec to 1.67×10^{-3} ft/sec. The hydraulic conductivity values calculated for the wells tested in 1988 are presented in Table 4-6.

4.5.2.2 *Bedrock Aquifer*

Figures 4-15 through 4-21 show the potentiometric surface of the shallow bedrock aquifer interpreted from the comprehensive water level rounds collected to date. As shown on these figures, the ground water elevations decrease from northwest to southeast beneath the site. The interpreted ground water flow direction in the bedrock aquifer fluctuates locally. However, the general southeastward flow direction in the shallow bedrock aquifer has remained consistent since 1988.

Horizontal hydraulic gradients in the shallow bedrock aquifer range from 0.0010 to 0.0033. Over most of the site, a downward vertical gradient exists between the intermediate overburden and bedrock wells. The influence of the recharge from the storm water retention pond to the shallow system is not apparent in the bedrock.

In June 1988, pump tests were conducted on existing production wells to determine aquifer characteristics and the respective capture zones of the wells. Historically, when the wells were in operation, the plant normally extracted greater than 1 million gallons of water per week for use in production activities. Figure 4-1, excerpted from the 1989 Phase I Remedial Investigation, shows the capture zone of former production well 6D after 6 hours of elapsed time since the start of the pump test. The elongated cone of depression observed around well 6D illustrates the effect of the anisotropic characteristics of the aquifer.

Ground water flow in the Passaic Formation is primarily along bedding planes. Evidence that the greater hydraulic conductivity of the aquifer at Givaudan-Roure is approximately parallel to the strike of bedding is provided by the orientation of the long axis of the cone of depression in Figure 4-1.

Transmissivity and storativity values calculated from the 1988 pump test data are presented in Table 4-7. Transmissivity values range from 1.66

x10^4 gpd/ft in well 5D to 5.56 x 10^4 gpd/ft in well 9D. Storativity values range from 7.2 x 10^{-4} in well 12D to 8.5 x 10^{-3} in well 9D.

Hydraulic conductivity values calculated from slug testing of the deep wells in 1988 are presented in Table 4-8. Values ranged from 4.98 x 10^{-8} ft/sec in well 3D to 3.33 x 10^{-4} ft/sec in well 12D. The extremely low hydraulic conductivity obtained from well 3D is related to the length of the open hole interval (approximately 550 feet) of the former production well. It is possible that the head change only affected the upper portion of the aquifer, but the value was averaged over the entire length of the borehole.

4.5.3 *Water Level Study*

The water level study was initiated on 20 January 1998. As discussed in Section 3.9, the objective of the water level study was to assess whether an unidentified pumping well might exist in close proximity to the site, affecting ground water flow direction. The water level study was conducted for a period of approximately 6 days to allow for a long enough data collection interval to identify intermittent pumping, as would be expected in an industrial setting.

Figures 4-22 through 4-25 show ground water elevation changes observed during the study. Figure 4-26 is a plot of the barometric pressure data collected during the test.

Each of the dataloggers collected data for the extent of the study except the one installed in monitoring well MW-24D due to a malfunctioning datalogger. The data collected from well MW-24D is consistent with the other wells.

The data collected during the water level study confirms that the deep aquifer at the southern portion of the site is impacted by tidal fluctuations. No evidence of off-site pumping was detected during the water level investigation. Approximately 3 days after the start of the test, a significant several day rain event moved through the area. All of the data, except from well MW-24D, show evidence of the storms. In well MW-25D, the tidal fluctuations are still observed, but a slight rise in average water levels is represented. Wells MW-10D and MW-26D reacted similarly but do not show a smooth cyclic tidal fluctuation like MW-25D due to rain water entering the wells.

The data presented in Figures 4-22 through 4-25 correlate very well. The frequency of tidal fluctuations is consistent between the wells. The consistent cyclic nature of the curves and absence of inversely

Table 4-8
Bedrock Aquifer Hydraulic Conductivity Values
June 1988 Slug Testing
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

Well Number	Hydraulic Conductivity(ft/sec)
3D	4.98×10^{-8}
5D	1.16×10^{-5}
9D	1.83×10^{-4}
10D	1.67×10^{-4}
11D	5.37×10^{-5}
12D	3.33×10^{-4}

Figure 4-22
MW-10D Hydrograph
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

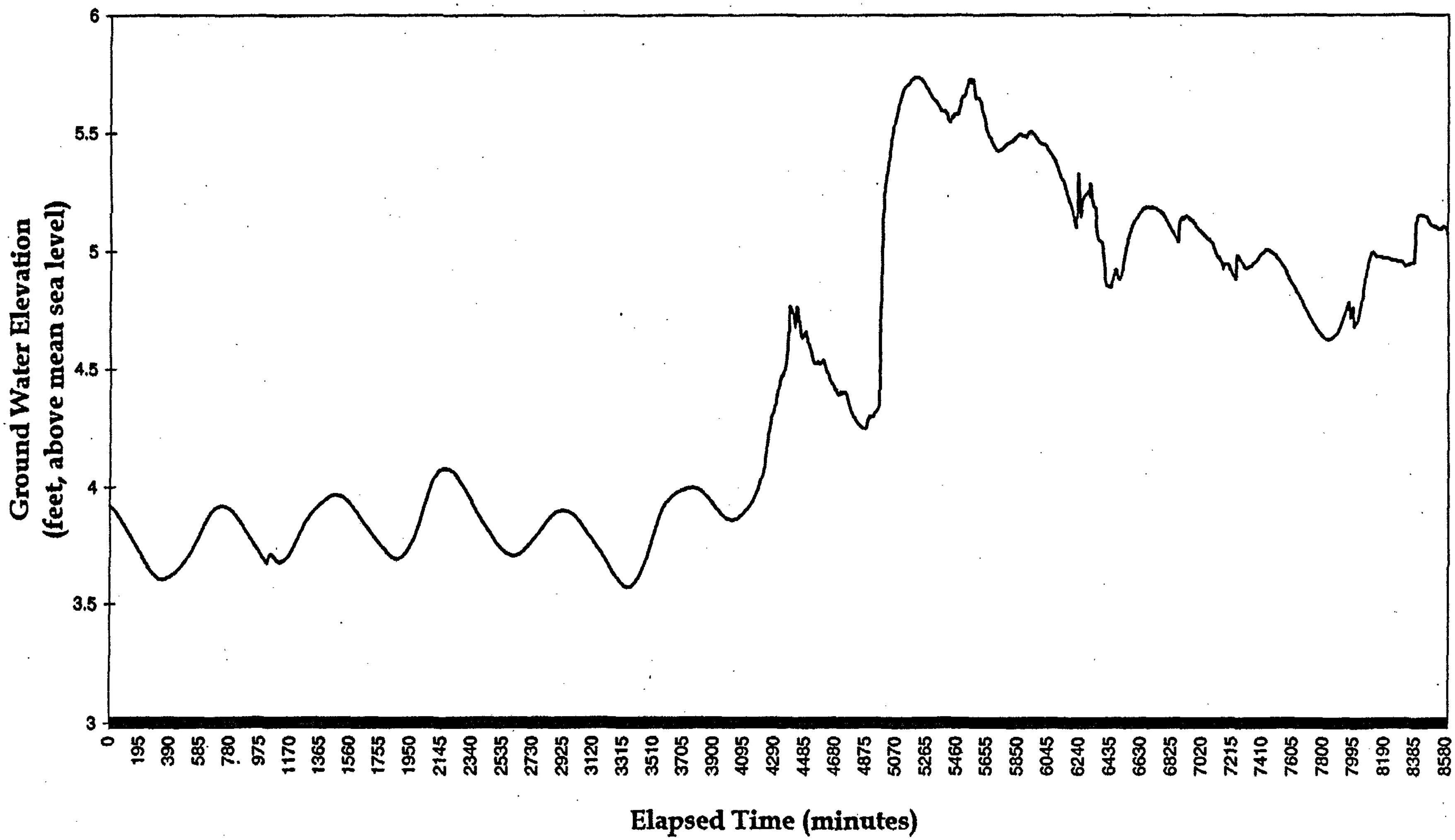


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Figure 4-23
MW-24D Hydrograph
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

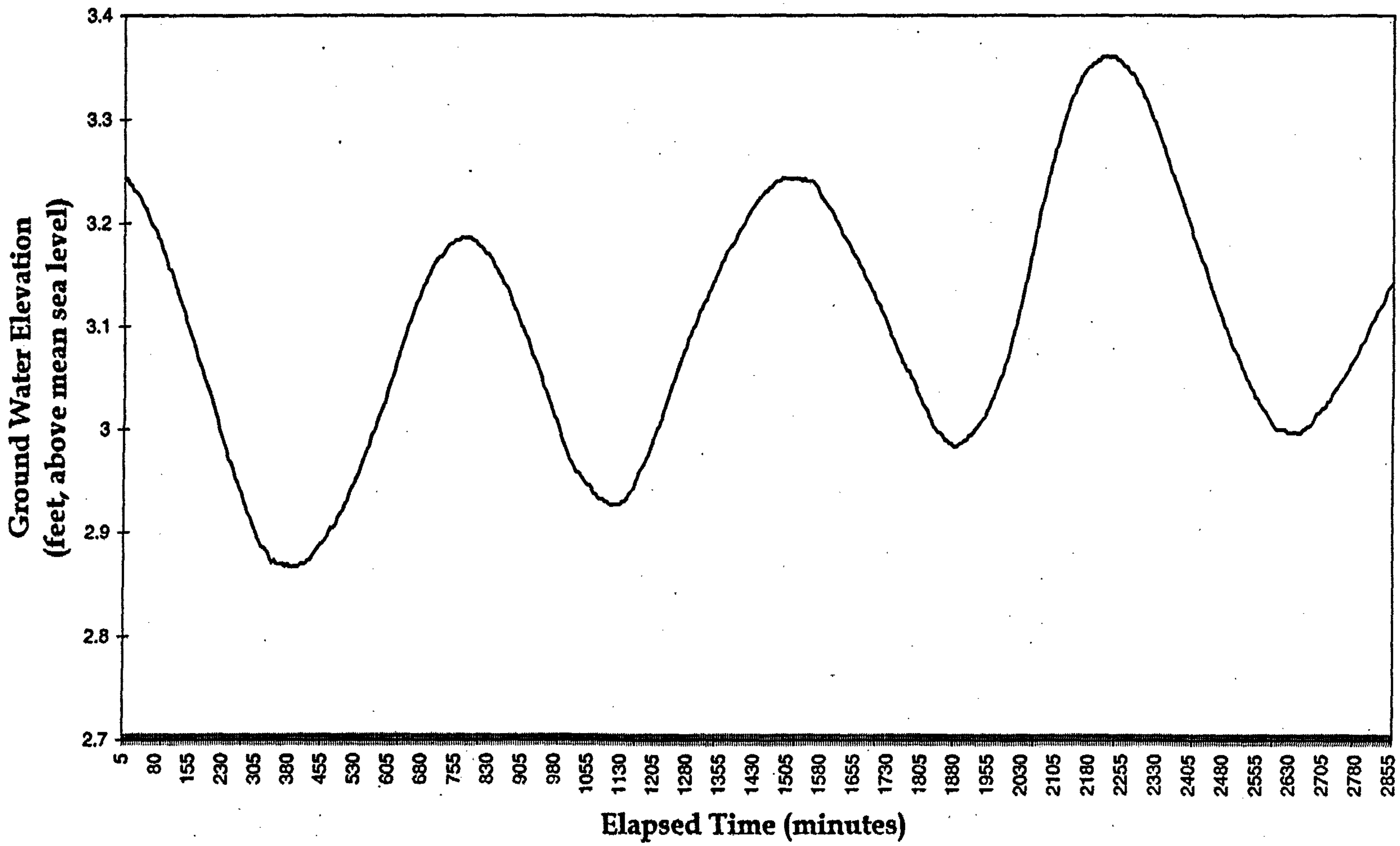

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Figure 4-24
MW-25D Hydrograph
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

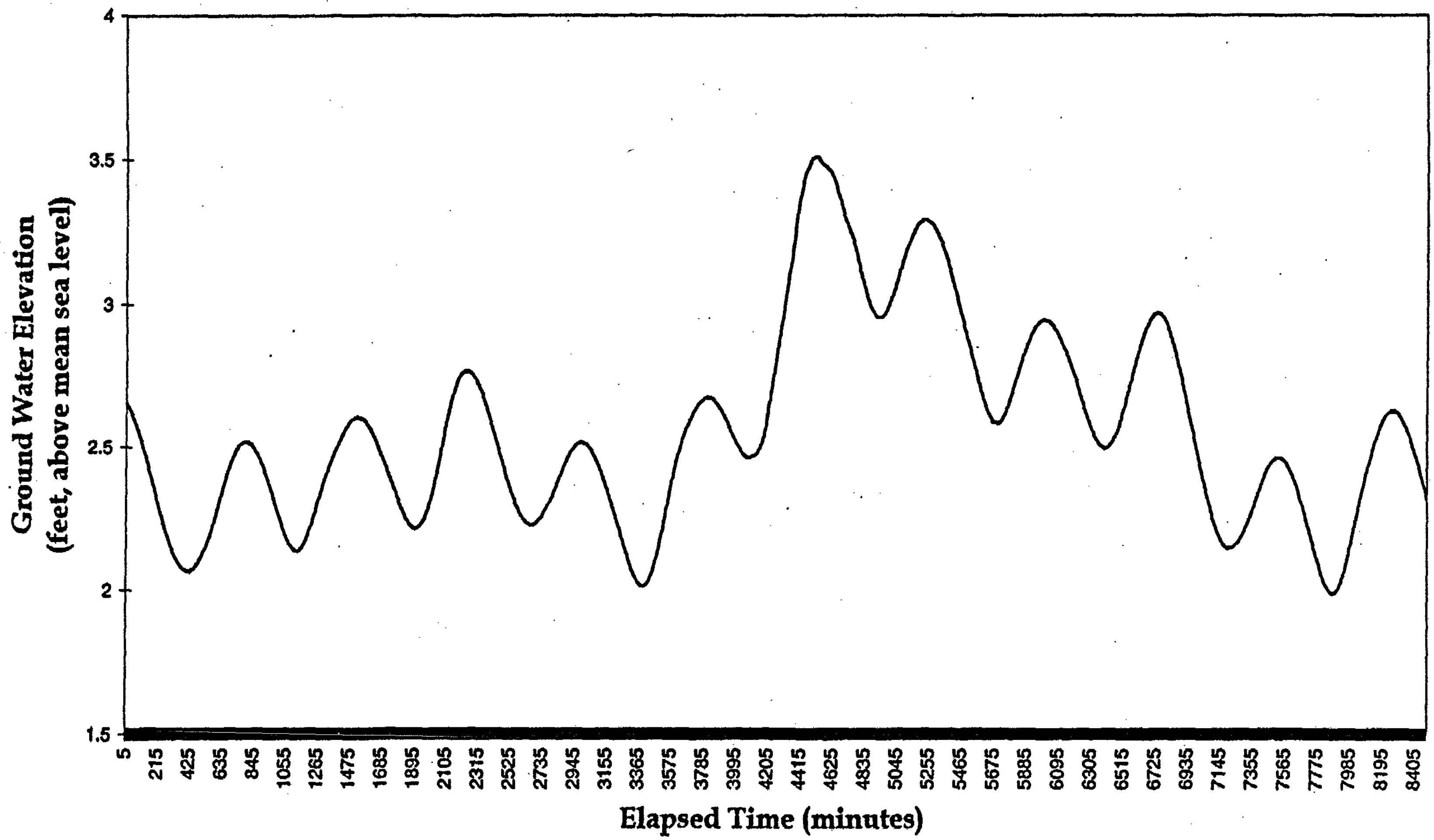

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Figure 4-25
MW-26D Hydrograph
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

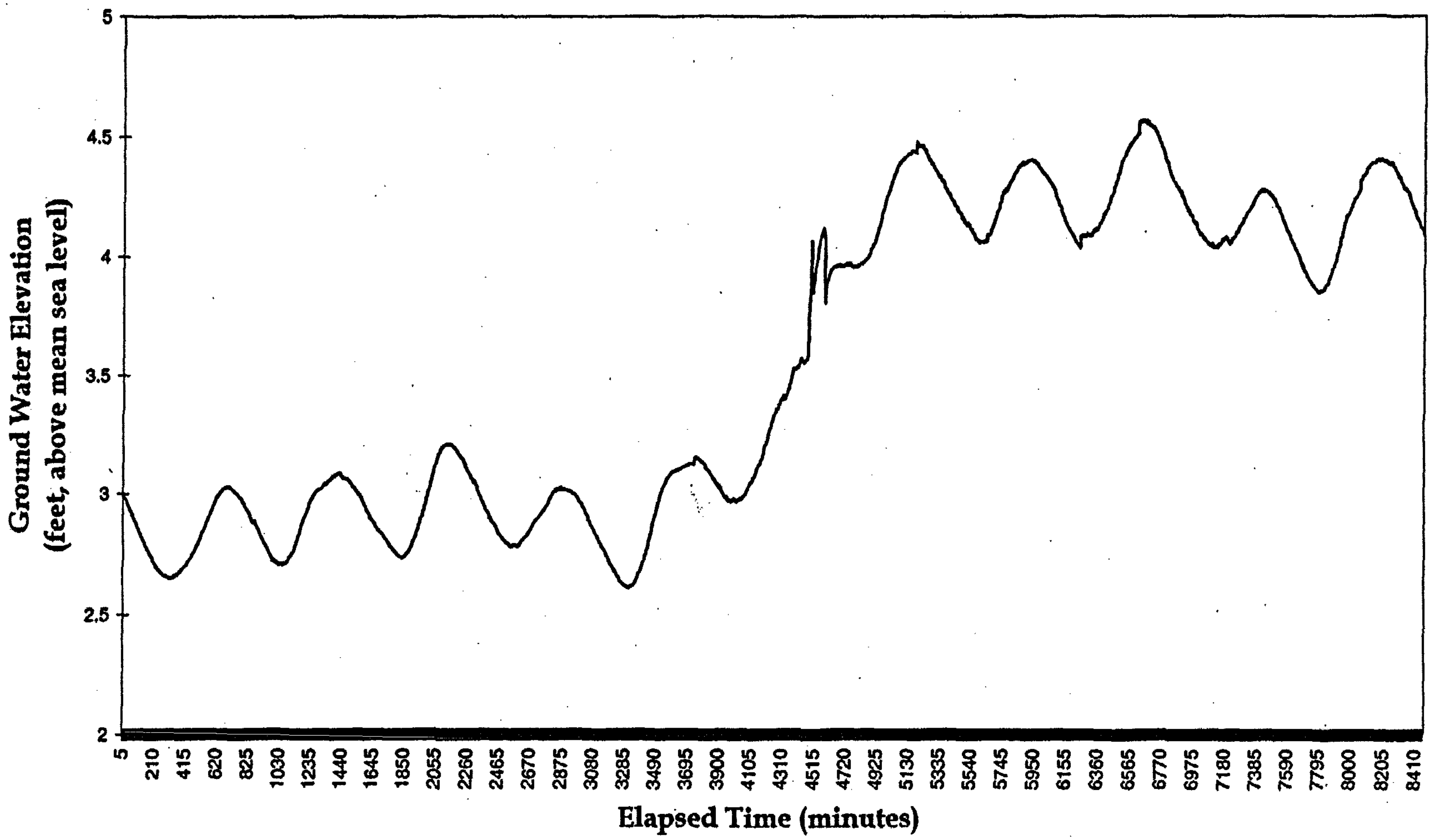

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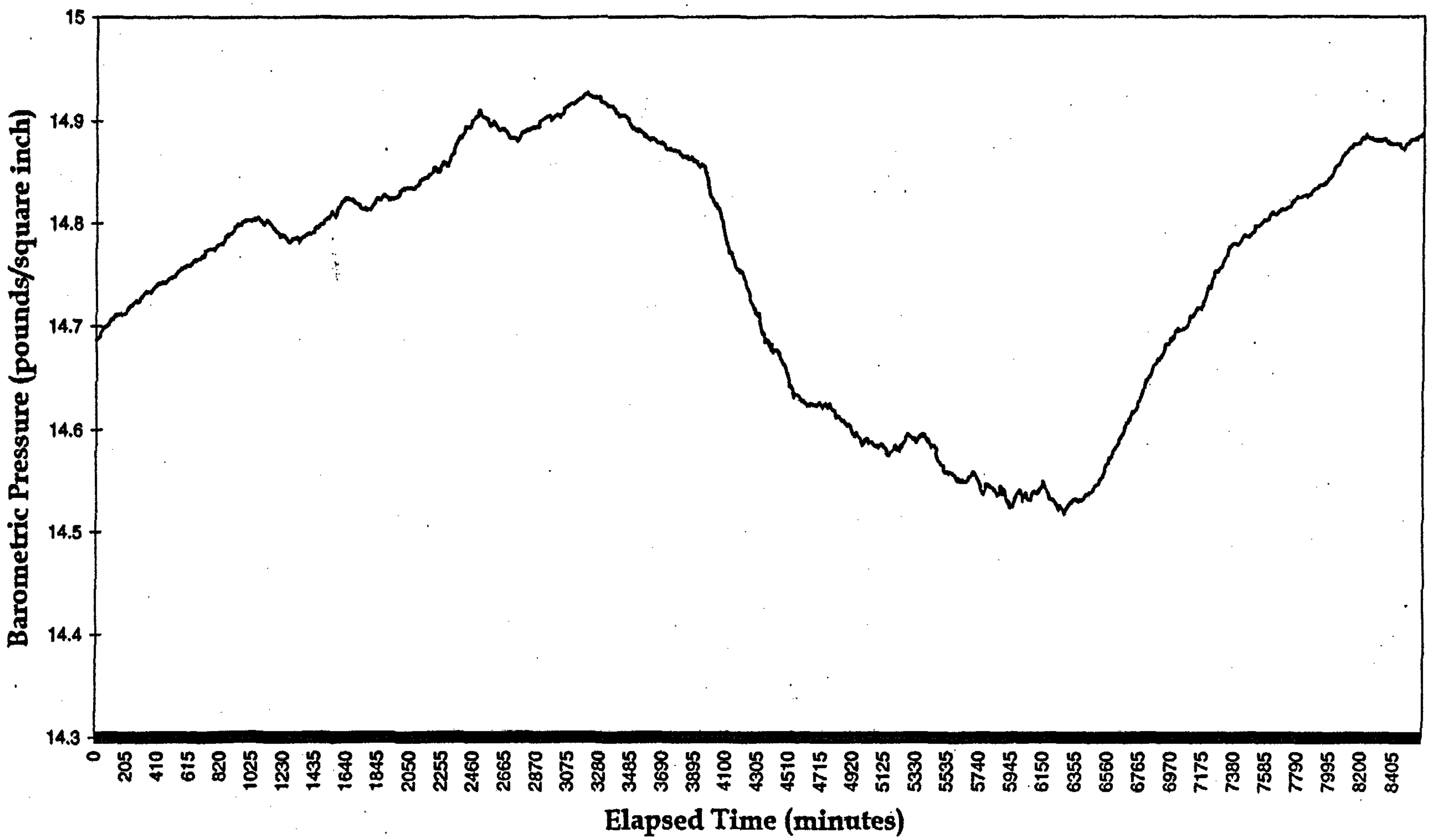
Figure 4-26
Barometric Pressure vs. Time
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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proportional corresponding barometric pressure changes demonstrates that the fluctuations in elevation are the result of the tidal cycle.

4.6 GROUND WATER MODELING

4.6.1 Overburden Aquifer Model Simulations

Figure 4-27 presents the simulated current ground water flow condition in the overburden aquifer with the storm water retention pond in place. The modeling indicates that the storm water retention pond creates a water table mound and ground water flows away from the pond.

The storm water retention pond also creates a stagnation area directly west of the pond and near the railway tracks. Ground water flow rates within this stagnation area are expected to be much slower than the rest of the area.

The infiltration rate of the storm water retention pond at the site varies seasonally. Figure 4-27 represents a relatively high water table condition. Different infiltration rates were simulated in the model to reflect seasonal fluctuation. The modeling indicates that the general ground water flow patterns remained similar to what is presented in Figure 4-27 under various water table conditions.

4.6.1.1 Sensitivity Analysis

Parameters which could be sensitive to the overburden aquifer model are:

- elevations of ground water discharge area;
- net infiltration rates; and
- aquifer transmissivity.

Reliable surface water elevation data are available from USGS maps. The elevations of ground water discharge areas are, therefore, not sensitive to modeling predictions. This is especially true for this particular model because the discharge boundaries are relatively far away from the site.

The aquifer transmissivity value was based on field slug tests and may not reflect the regional average value for the overburden aquifer. The aquifer transmissivity value and infiltration rate are interdependent upon each other in ground water model. Once one parameter is selected, the other can be determined during model calibration. As the aquifer transmissivity increases or decreases, the area infiltration should increase or decrease proportionally. The ratio between them controls the modeled

Figure 4-27
Modeled Ground Water Flow in Overburden Aquifer
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

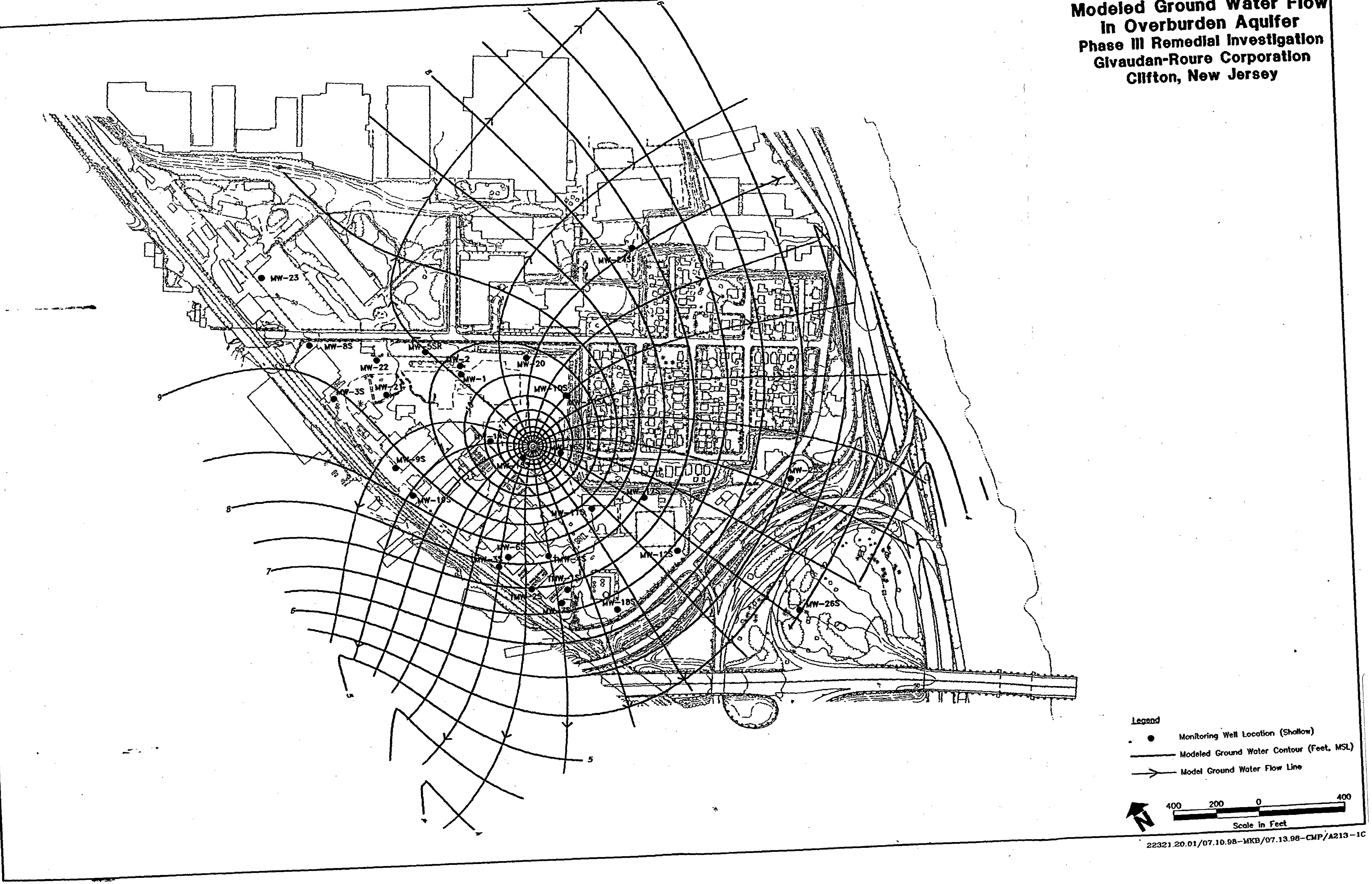

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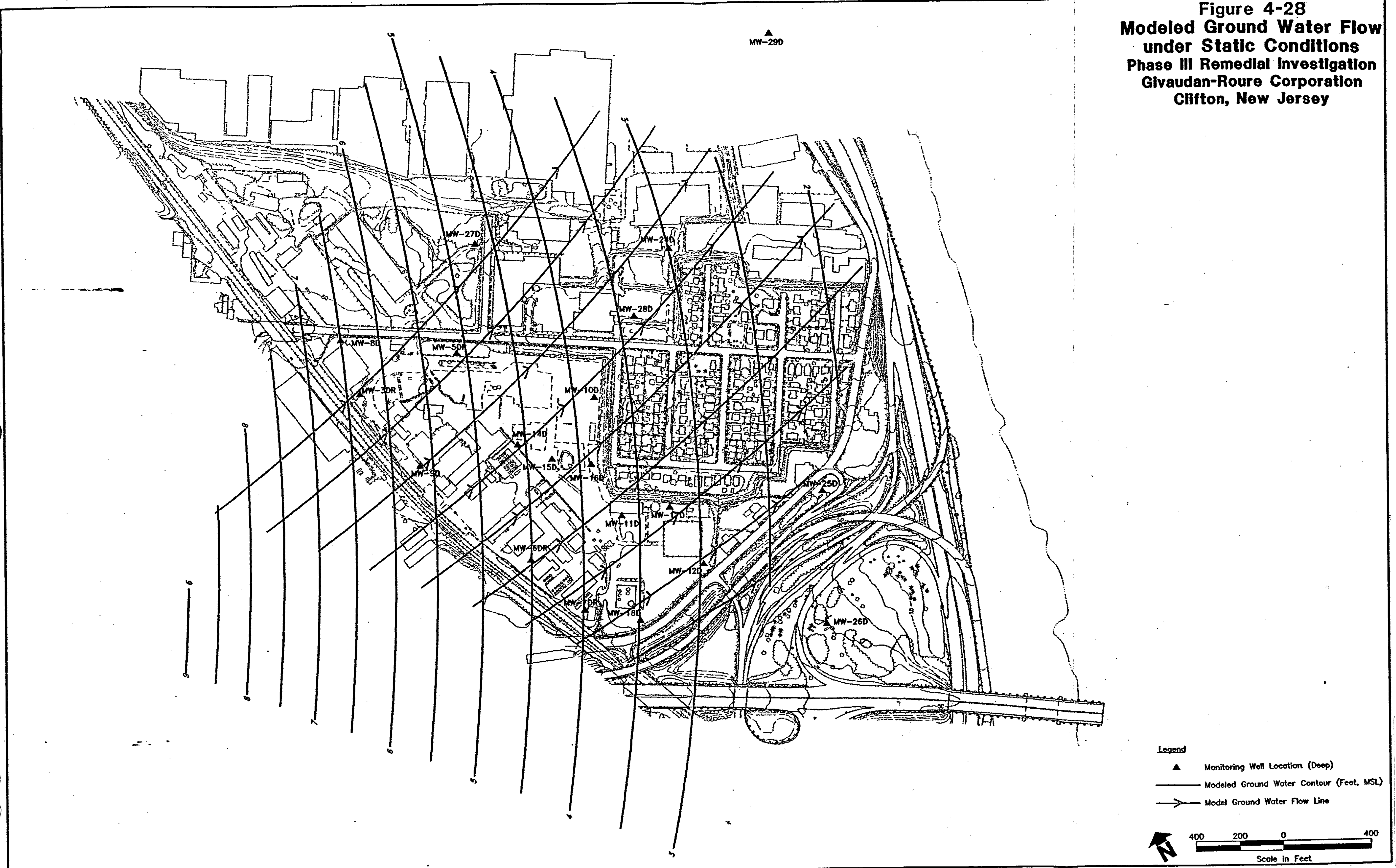
Figure 4-28
Modeled Ground Water Flow under Static Conditions
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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22321.20.01/07.10.98-MKB/07.13.98-CMP/A214-1C ground water levels and can be determined in the model calibration process. Once the model is calibrated properly, the modeled ground water contours and flow pathways remain similar regardless of the exact selections of aquifer transmissivity value and infiltration rate.

This relationship was verified for this modeling during the sensitivity evaluation. If the aquifer transmissivity is 50 percent higher or lower than the value used by the model, the calibrated net infiltration rates have to be 50 percent higher or lower.

Likewise, recharge rates of the storm water retention pond and aquifer transmissivity are interdependent under a particular ground water table condition. If the aquifer transmissivity is 50 percent higher or lower than the model used, the recharge rate should also be 50 percent higher or lower.

4.6.2 *Bedrock Aquifer Model Simulations*

4.6.2.1 *Current Condition*

Figure 4-28 presents the modeled current ground water potentiometric contours and flowlines in the bedrock aquifer. The modeling predicts a hydraulic gradient of approximately 0.21 percent in an east to southeast direction towards the Passaic River. Due to the aquifer anisotropy, the actual ground water flow direction is deflected to flow east, approximately 33 degrees from the hydraulic downgradient direction.

4.6.2.2 *Historical Pumping Condition*

Figure 4-29 presents the modeled ground water potentiometric contours and well capture zone under a historical pumping condition in which well No. 7 was pumping at approximately 200 gpm. The capture zone of this well covers the entire plant production area. It can be seen that virtually all of the water on-site was captured by this pumping.

4.6.2.3 *Sensitivity Analysis*

Parameters which could be sensitive to the deep aquifer model are:

- elevations of ground water discharge area;
- net infiltration rates; and
- aquifer transmissivity.

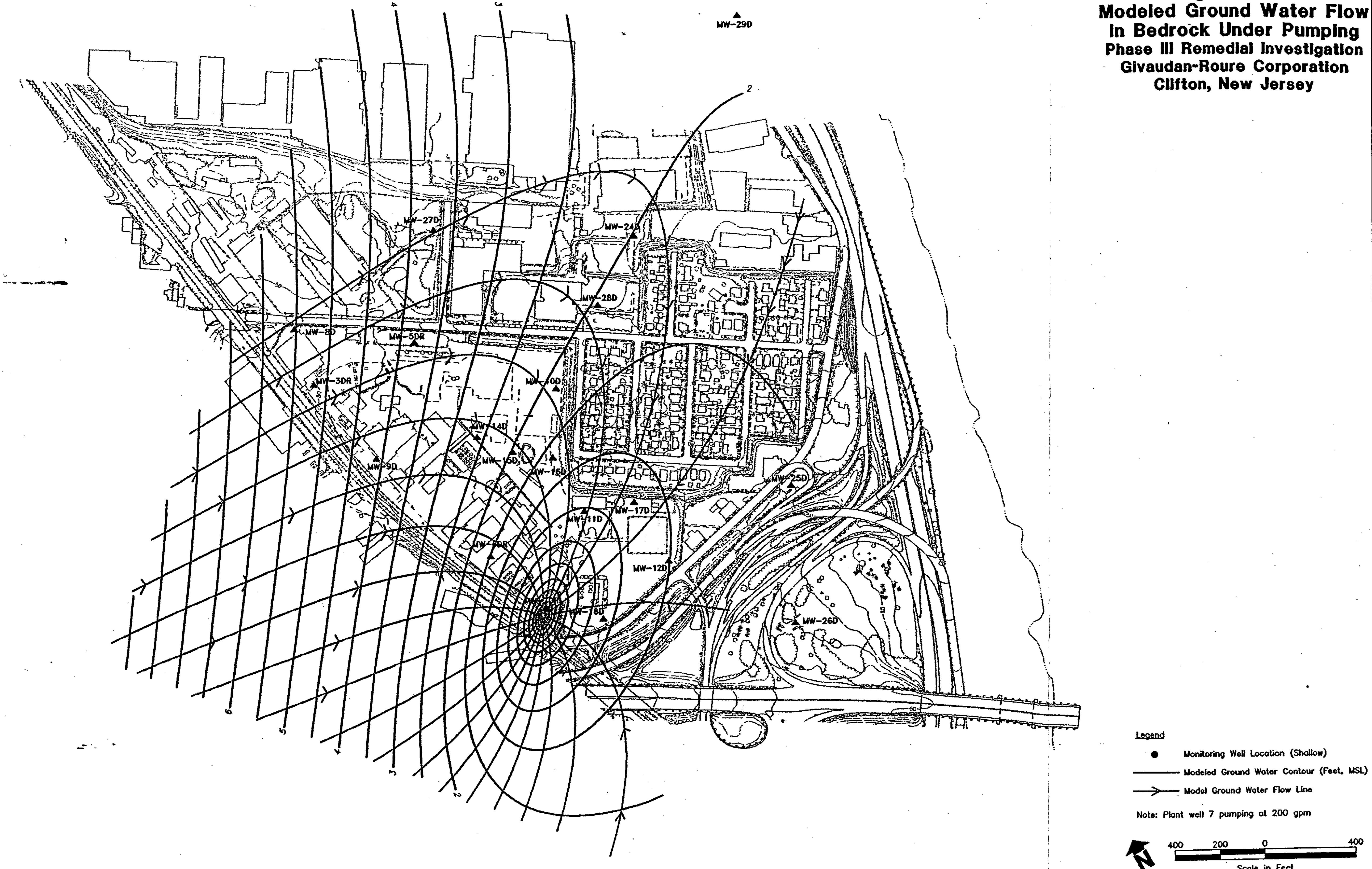
Reliable surface water elevation data are available from USGS maps. The elevations of ground water discharge areas are, therefore, not sensitive to modeling predictions. This is especially true for this particular model because the discharge boundaries are relatively far away from the site area.

The aquifer transmissivity value was based on field pumping tests conducted within the site area and may not reflect the regional average value. Aquifer transmissivity value and infiltration rate are interdependent upon each other in ground water modeling. Once one parameter is selected, the other can be determined during model calibration. As the aquifer transmissivity increases or decreases, the area infiltration should increase or decrease proportionally. The ratio between them controls the modeled ground water levels and can be determined in the model calibration process. Once the model is calibrated properly, the modeled ground water contours and flow pathways remain similar regardless of the exact selections of aquifer transmissivity value and infiltration rate.

This relationship was verified for this modeling during the sensitivity evaluation. If the aquifer transmissivity is 50 percent higher or lower than the value used by the model, the calibrated net infiltration rates have to be 50 percent higher or lower.

The size of the well capture zone will change with the change in the aquifer transmissivity value. If the actual aquifer transmissivity value is increased or decreased by 50 percent, the diameter of the capture zone width will also increase or decrease by 50 percent, respectively.

Figure 4-29
Modeled Ground Water Flow in Bedrock Under Pumping
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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5.0 *FATE AND TRANSPORT OF CONTAMINANTS OF CONCERN*

Based on a comprehensive review of the analytical results, VOCs were found to be the predominant constituents detected in ground water. The principal source areas for impacts to ground water are:

- Area A - the old chemical sewer to the southwest of Building 84;
- Area B - the area which includes the old chemical sewer near boring WA-07, former Building 22 and 28 rows, and the former botanical landfill;
- Area C - consisting of the former spent acid pit and storm water retention pond and the former Maintenance Building (Building 50);
- Area D - defined as the former railcar off-loading and drum storage area near Building 69; and
- Area E - defined to be the area adjacent to Building 82 where an accidental release from process equipment may have occurred.

This section provides a description of the transport mechanisms of contaminants of concern on the site understood to be occurring based on the available data. This discussion is divided into two sections: a discussion of the general conceptual model for the site which relates distribution of constituents of concern to potential source areas; and a discussion of specific source areas.

5.1 *FATE AND TRANSPORT OF CONTAMINANTS BY INVESTIGATION AREA OF CONCERN*

As discussed in earlier sections, the facility has operated as a chemical manufacturing facility for nearly 100 years. During that period, material handling practices have evolved and improved as a function of increasing awareness and regulation. Prior to implementation of RCRA in 1980 and subsequent improved waste handling practices, discharges to the subsurface occurred. These discharges to ground water occurred from four possible sources: (1) the old chemical sewer; (2) the former spent acid pit and storm water retention pond, (3) former botanical landfill, and (4) off-loading and drum storage over unpaved areas.

Figure 5-1 presents a graphical view of the potential areas of impact, divided into five areas of concern. The following sections provide a detailed discussion of specific areas of concern.

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Figure 5-1
Potential Areas of Impact Conceptual Model
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

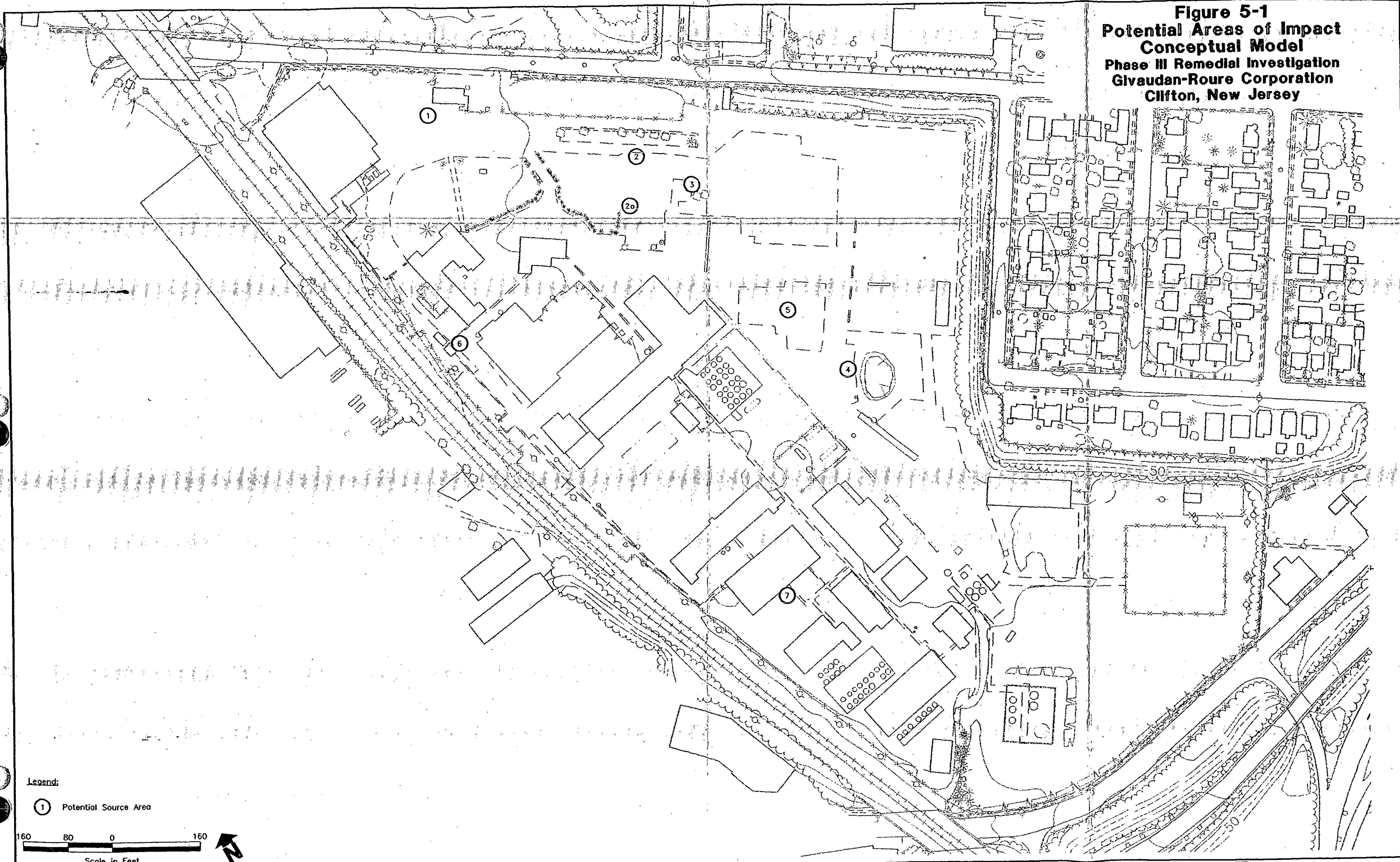

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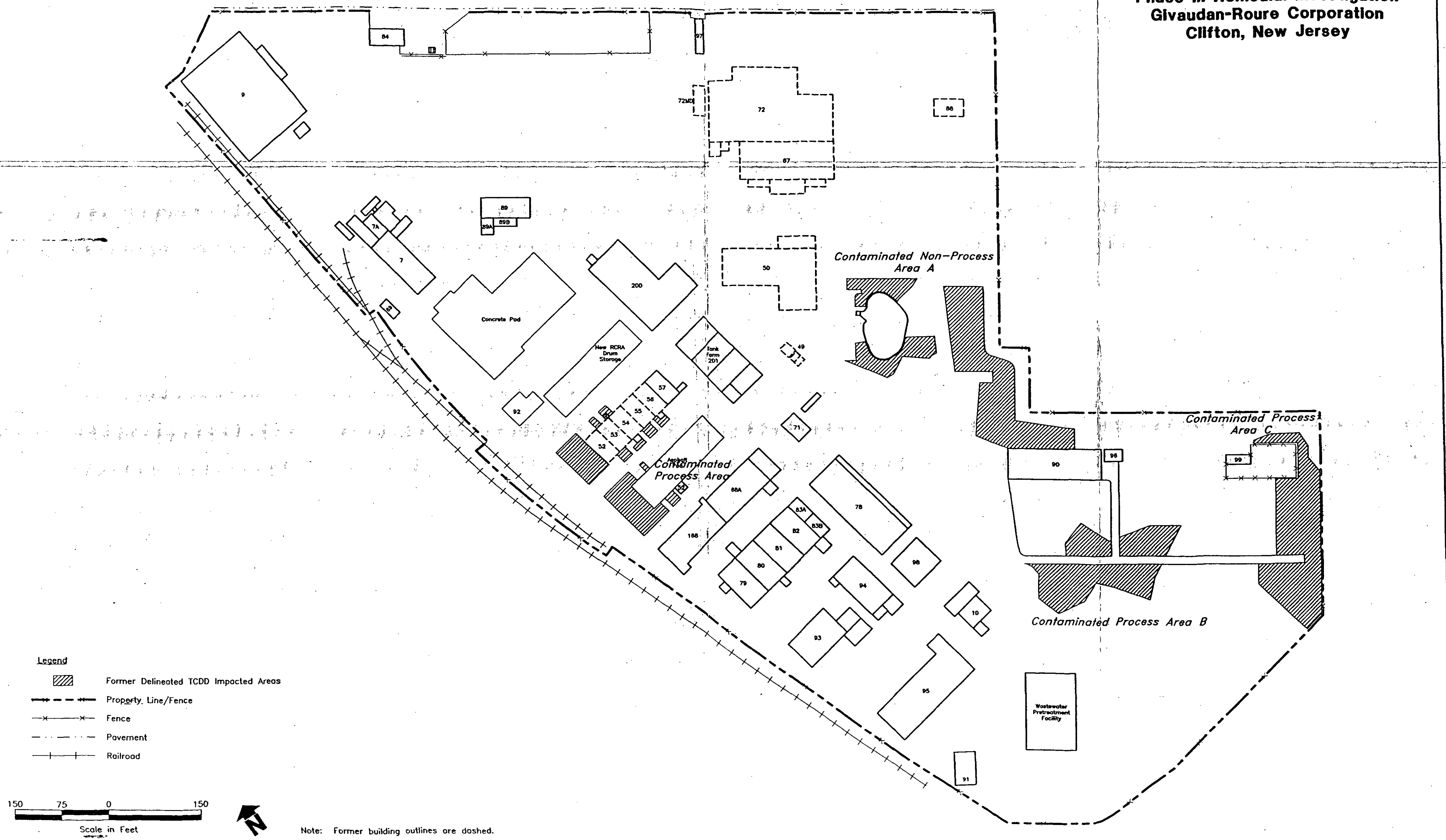
Figure 2-5
Former TCDD Impacted Areas
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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5.1.1 *Area A*

Area A is characterized by a suspected exfiltration point in the old chemical sewer (Figure 5-1, Reference 1). As indicated by the analytical data collected from this area, the primary constituents of concern are toluene and xylene. This result is consistent with the former use of the old chemical sewer. Toluene and xylenes, primary raw products for manufacturing operations, were discharged through the old chemical sewer from Building 9 to the treatment plant located in the southern part of the plant.

The data indicate an exfiltration point in the old chemical sewer likely exists in the area proximal to boring location CSB-01, completed during the RIS. Therefore, it is concluded that toluene and xylenes (and minor concentrations of other constituents) were introduced into the subsurface in a dilute aqueous solution of variable strength. These constituents migrated vertically to ground water, resulting in the observed localized impacts to ground water. This conclusion is supported by the soil analytical data indicating high concentrations of toluene at a depth of 10 to 12 feet (directly beneath the old chemical sewer) and corresponding high concentrations of toluene at the inferred water table (approximately 36 feet). Lateral dispersion of toluene in the unsaturated zone from the exfiltration point is minimal as defined by adjacent borings. Lateral dispersion of toluene in ground water is documented by high concentrations of toluene detected in monitoring well MW-22, located hydraulically downgradient of Area A.

Ground water elevation data and results of ground water modeling (Figure 5-2) suggest that Area A may be contributing to the toluene and xylene observed in MW-5S in 1988 and 1996 sampling events (1,700 μg/L and 1,600 μg/L, respectively). The concentrations of these specific constituents of concern observed in November 1997 have decreased up to two orders of magnitude. This decreasing trend in toluene and xylenes correlates closely with the abandonment of the old chemical sewer in the early to mid-1980's. The abandonment of the old chemical sewer eliminated a continuing source of toluene/xylenes impact to ground water.

It is concluded from the data that impacted soils observed at depth (approximately 36 feet) in Area A intersect the overburden aquifer and may be acting as a residual, yet continuing source for toluene and xylenes to ground water.

5.1.2 *Area B*

Area B is characterized by the presence of three potential source areas:

(1) an exfiltration point observed in the old chemical sewer during the removal of Tank T-56 (Figure 5-1, Reference 2);

(2) exfiltration points in the old chemical sewer adjacent to Building Rows 22 and 28 detected during a 1983 hydrostatic survey of the sewer (Figure 5-1, Reference 2a); and

(3) the former botanical landfill (Figure 5-1, Reference 3)

The potential impact of the exfiltration point observed in the old chemical sewer during the removal of Tank T-56 is confirmed by post excavation soil samples collected in 1994 and shallow soil samples collected in 1995 during the RIS. As previously noted, toluene and xylenes were transported through the old chemical sewer in aqueous solutions.

Soil data collected from boring WA-07 (RIS, 1995) immediately above the water table and beneath the excavation for T-56 indicated the presence of toluene and xylenes at concentrations approximately one order of magnitude greater than those detected in the post excavation samples. In addition, PCE was detected in this sample, indicating the presence of a source contributing chlorinated solvents to ground water in this area. Further evidence of discharge of chlorinated solvents in this area was obtained from an in-situ ground water sample taken at boring PSD-02 (PSD-02W). Chlorinated organic compounds, specifically TCE, cis-1,2 dichloroethene (cDCE), 1,1-dichloroethane (1,1-DCA), 1,2- DCA, and vinyl chloride (VC) were detected in PSD-02W. This result is significant when considering the spatial relationship between the location of PSD-02W, Tank 56, the Building 22 and 28 rows (demolished), former botanical landfill, and the former Maintenance Building (Building 50, demolished). PSD-02W and WA-07 (installed adjacent to former tank T-56) are located hydraulically downgradient of the Building 22 and 28 rows, former Botanical Landfill, and Building 50. Therefore, it can be concluded that the constituents detected in PSD-02W and/or WA-07 may be attributable to accidental releases from one or more of these potential source areas. The radial flow patterns shown in Figure 5-2 illustrate the potential for this scenario to exist.

It is concluded from the analytical data that Area B represents a commingled source area for chlorinated and non-chlorinated organic constituents in soil and shallow ground water. As will be discussed later, this area is also considered to be a potential source area for the 1,2-DCA detected in the bedrock monitoring well MW-24D. As demonstrated by the ground water flow model which incorporates the effects of the anisotropy of the aquifer, MW-24D is located hydraulically downgradient of Area B under non-pumping (current) conditions. Based on the distribution of contaminants in the ground water, it is concluded that the presence of toluene and xylenes stimulated the anaerobic degradation of chlorinated organics in this area through co-metabolic processes. This is supported by the detection of daughter products of PCE and 1,1,1-TCA in PSD-02W.

5.1.3 *Storm Water Retention Pond and Former Spent Acid Pit (Area C)*

Analytical data indicate that the storm water retention pond and former spent acid pit are also potential source areas for organics detected in the ground water on the site (Figure 5-1, Reference 4). For the purpose of discussion and because of its proximity to the spent acid pit and storm water retention pond, former maintenance building (Building 50) is included in Area C as a potential source area (Figure 5-1, Reference 5).

Prior to 1961, the spent acid pit was used as an effluent pit for plant operations. It should be noted that 1,2-DCA was detected in 20 soil samples from the site. Of these 20 samples, 11 samples were located in the vicinity of the former spent acid pit. Additionally, the samples containing the two highest concentrations of 1,2-DCA (440 μg/Kg and 250 μg/Kg) were collected from borings completed adjacent to the interpreted edge of the former spent acid pit (as it is observed on aerial photographs presented in the 1988 Phase I RI.

It is assumed that the spent acid pit was unlined, therefore, any accumulation of water containing dissolved phase VOCs would infiltrate vertically through the underlying soil. The storm water retention pond also receives surface water runoff from the majority of the plant through sheet runoff or the storm sewer. Thus, accidental, minor releases from operation areas may have impacted the surface water discharging to the pond. Since the existing storm water retention pond was present while the former spent acid pit was in operation, impacted ground water in this location would have been distributed radially away from the pit, as demonstrated by Figure 5-2. The detection of 1,2-DCA in MW-5S, MW-10S and MW-14S likely resulted from the artificial hydraulic gradient induced by the ground water mounding effect from the storm water retention pond (located to the east of the spent acid pit). As this impacted water migrated vertically and entered the bedrock aquifer, it was subjected to the anisotropic flow conditions of the aquifer enhanced by pumping of former production wells 6D and 7D (Figures 5-3 and 5-4).

Although the potentiometric surface of the bedrock aquifer suggests an east and southeasterly flow direction, the ground water model, which incorporates the anisotropy of the aquifer, demonstrates that bedrock aquifer flow is parallel to the strike of bedding towards the Passaic River. Further evidence of this flow direction is provided by the detection of 1,2-DCA in MW-24D and the detection of 2-methyl-2-propanol in wells MW-27D and MW-29D.

Based on headspace data collected during drilling, the absence of visual indications of a free phase liquid, the relatively low levels of 1,2-DCA detected in soil in the vicinity of the spent acid pit, and the low concentrations of 1,2-DCA detected in ground water, it is concluded from the available data that organic constituents, primarily 1,2-DCA, were introduced into the subsurface through the storm water retention pond and spent acid pit as an aqueous mixture. Following introduction to the subsurface, organic constituents migrated from the area under two mechanisms:

(1) lateral migration in the shallow overburden aquifer under the influence of radial flow patterns caused by the storm water retention pond effect, and

(2) vertical migration to bedrock and then laterally under influence of ground water movement in the bedrock.

As a result of the large volume of water that infiltrates through the storm water retention pond, the areas of the former spent acid pit and storm water retention pond have essentially undergone almost continuous "flushing" since the closure of the pit over 30 years ago. Thus, residual 1,2-DCA present in this location has been diluted to trace to low levels in the immediate area of the historical source.

The occurrence of metals in ground water may be attributed to leaching of metals from the spent acid pit and native soils and bedrock. Except for aluminum, iron, manganese, and sodium, metals generally occurred coincidentally with AOCs identified for organic constituents. These metals include: lead, zinc, copper, nickel, chromium, and arsenic; all of which are strongly associated with iron- and/or manganese-oxides. Because the mobility of iron and manganese is low except in acidic and reducing environments, these data suggest that iron and manganese were leached in the vicinity of the spent acid pit and precipitated downgradient where the water became less acidic. The lack of significant occurrence of lead, zinc, copper, nickel, chromium, and arsenic in the filtered samples relative to unfiltered samples correlates with significantly lower iron and manganese concentrations in the unfiltered samples. This suggests that these metals are generally not present in the dissolved state, and that their occurrence is limited by the abundance of suspended iron- and manganese-oxides.

This phenomenon is evident upon close examination of the data from recently installed monitoring well nest 16, located immediately downgradient of the former spent acid pit. As expected, unfiltered samples from these wells contain the highest concentrations of several metals, including iron and manganese. The concentration of lead (6,320 μg/l) in MW-16D is more than 60 times greater than anywhere else onsite. This elevated concentration appears to be localized, as metals in the surrounding wells (MW-11D, MW-17D) and wells determined to be immediately downgradient (MW-10D, MW-24D) are generally present at what are interpreted to be naturally occurring concentrations. Except for manganese, sodium, and iron, no metals exceed the GWQS in filtered samples from well nest 16, and the concentrations of iron and manganese are one to four orders of magnitude lower than in their associated unfiltered samples. Other dissolved metals presumably coprecipitated with these (e.g. Ni and Cu) or were adsorbed onto the surfaces of the solid phase iron- and manganese-oxides (e.g. Pb, Zn, Cu, and Cr).

5.1.4 *Monitoring Well Nest 9 Area (Area D)*

Toluene was detected in MW-9S in 1988 at a concentration of 21,000 μg/L. Subsequent sampling events have detected significantly lower concentrations. Analytical data collected from this area of the plant suggest that the source for toluene detected in the ground water in this area is located near the railroad spur which enters the property. Based on recent discussions with veteran plant personnel, it was determined that this area was used to off-load rail tankers containing toluene into drums as well as drum storage (Figure 1, Reference 6). This activity reportedly ceased in the late 1970's to early 1980's.

Ground water analysis defines a dissolved-phase toluene plume originating near Building 69 and migrating in a generally southwest direction off the site. This plume attenuates rapidly in the downgradient direction. Analysis of soil samples from the Building 69 area detected residual toluene at concentrations up to approximately 3 mg/Kg.

5.1.5 *Monitoring Well Nest 6 Area (Area E)*

In the January 1996 sampling event, toluene was not detected in MW-6S or MW-7S. In March 1997, toluene was detected in MW-6S and MW-7S at 34,000 μg/L and 250 μg/L, respectively.

In later sampling events, the concentrations of toluene in MW-6S decreased while the concentration of toluene detected in MW-7S increased to a maximum of 19,000 μg/L in June 1997. After May 1998, the concentration of toluene decreased to less than the GWQS in both wells. This trend is illustrated in Figure 4-6.

It is concluded that the detection of toluene in MW-6S and MW-7S occurred due to a change in the operations in Building 82 which resulted in an accidental release of toluene to the sump or chemical sewer adjacent to Building 82 (Figure 5-1, Reference 7).

This conclusion is confirmed feasible by the following calculations of ground water flow velocities in this area:

$$V = ki/n$$

where:

V = darcy velocity
k = hydraulic conductivity (assumed to be 10^{-2} cm sec for silty sand. Reference Freeze and Cherry, 1979)
i = horizontal hydraulic gradient (estimated to be 0.0036 from calculated water elevations)
n = porosity (assumed to be .35 for silty sand from Freeze and Cherry, 1979)

therefore:

$$\begin{aligned} V &= (10^{-2}\ \text{cm/sec})(0.0036) / .35 \\ &= 1(10^{-4})\ \text{cm/sec} \\ &= 1.8\ \text{feet / day} \end{aligned}$$

Assuming the plume front would need to travel approximately 400 feet along the modeled flow path in less than 425 days (January 1996 to March 1997), is this likely?

$$t = d/V$$

where:

t = time in days
d = distance along modeled flow path
V = darcy velocity

therefore:

$$\begin{aligned} t &= \frac{400\ \text{feet}}{1.8\ \text{ft/day}} \\ &= 222\ \text{days} \end{aligned}$$

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Based on these calculations and results of the ground water modeling, it is concluded that the detection of toluene in MW-6S and MW-7S can be attributed to the same event and is the likely result of an accidental release of toluene related to the operations in Building 82.

5.2 *MIGRATION OF 1,2 DICHLOROETHANE*

The distribution of 1,2-DCA in ground water at the site defies depiction as a plume, and does not lead to any obvious source areas. However, it is known that this compound was used in quantity in the past by Givaudan-Roure and a closer examination of site conditions appears to clarify its distribution today. The nature of the releases to the ground water, and the historical changes in pumping conditions in the bedrock provide significant insight.

In the early 1980's, 1,2-DCA was detected in production well No. 6 at 15,000 μg/L and No. 7 at 84,000 μg/L By the 1990's, when these production wells had been idle for several years, the concentrations reduced by orders of magnitude. The current concentrations and the rapid reduction from such high levels over time clearly indicate that the original releases were in solution in ground water. This favors the spent acid pit/storm water retention pond and/or chemical sewers as sources. As previously discussed, 1,2-DCA has been detected at low residual levels in soils in the vicinity of the spent acid pit. Leaks in the chemical sewers have been identified in Area B, and evidence of biodegradation of once-high chlorinated solvents has been detected in ground water there.

The changing conditions in the bedrock aquifer appear to explain the distribution of the 1,2-DCA in the bedrock aquifer.

Specifically:

(1) Historical pumping likely drew high concentration 1,2-DCA from the spent acid pit and/or Area B to plant wells No. 6 and No. 7. Figure 5-4 shows that these areas were within the direct flow path to these pumping wells.

(2) Cessation of pumping in the mid-1980's restored natural flow conditions, and the 1,2-DCA plume from Areas B and C to the production wells began to redistribute downgradient, creating a very wide plume across the eastern/northeastern portions of the plant (Figures 5-5 and 5-6).

(3) Because the active release of 1,2-DCA in solution has ceased over several years the contamination dissipates, leaving ubiquitous, but low level concentrations on-site.

(4) A "slug" from Area B migrated away before biodegradation occurred, and is now present downgradient at MW-24D (Figure 5-6).

The above hypothesis is consistent with all of the site analytical data and also with the ground water flow model.

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Figure 5-2
Conceptual Model Plume Migration in Overburden Aquifer
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey

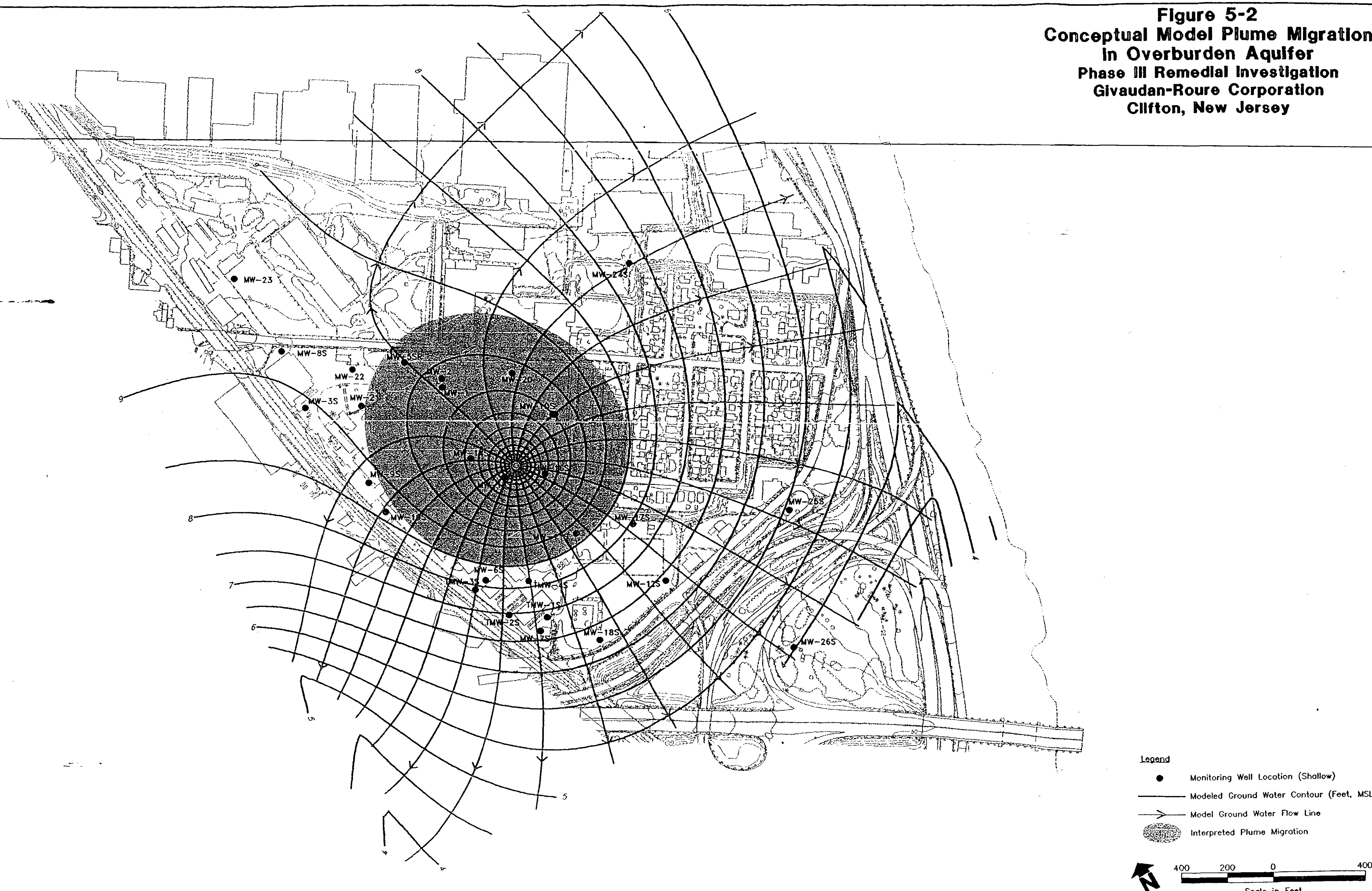

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Figure 5-3
Conceptual Model Under Pumping Conditions Cross-Section A-A'
Givaudan-Roure Corporation
Clifton, New Jersey

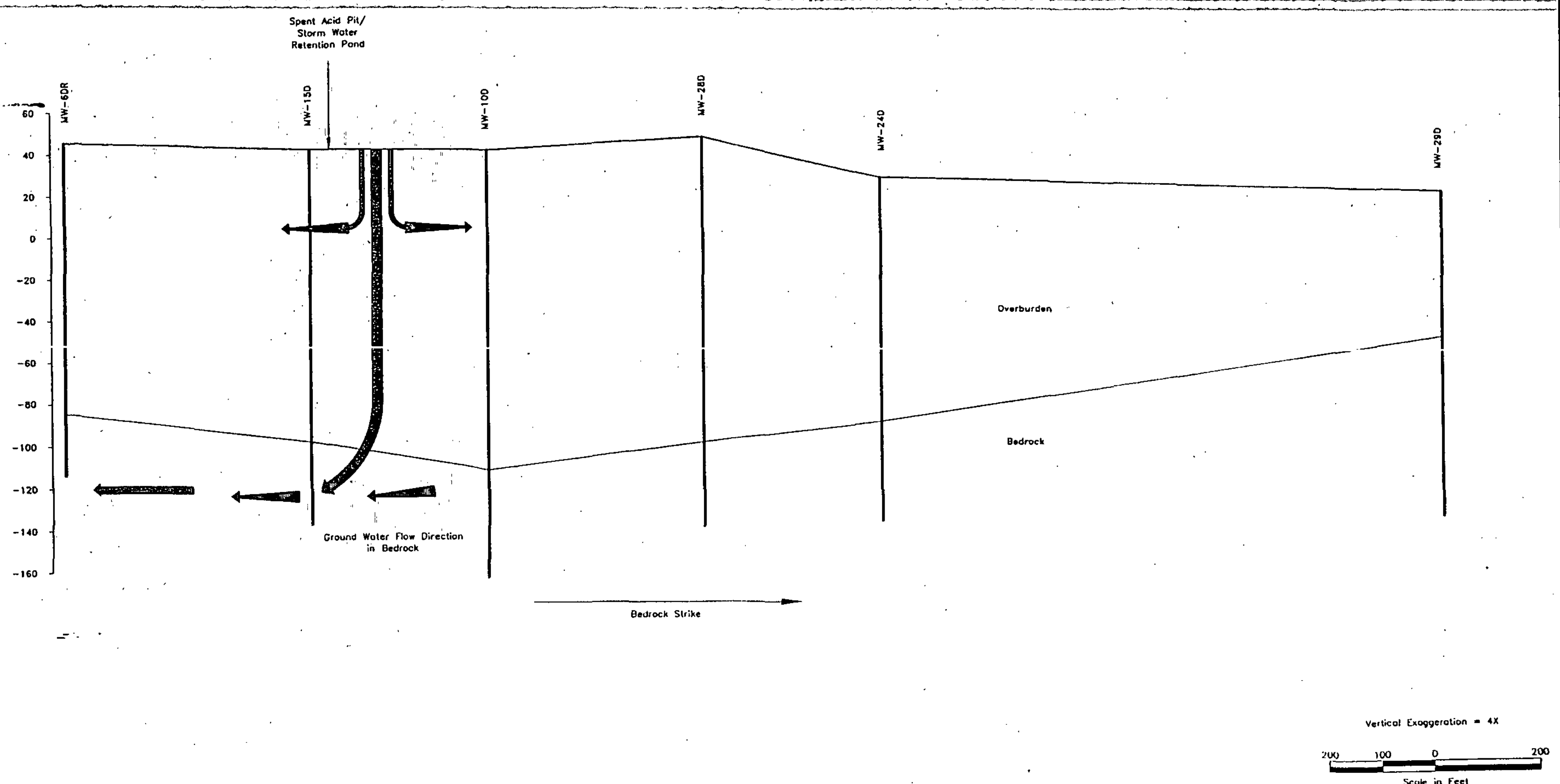

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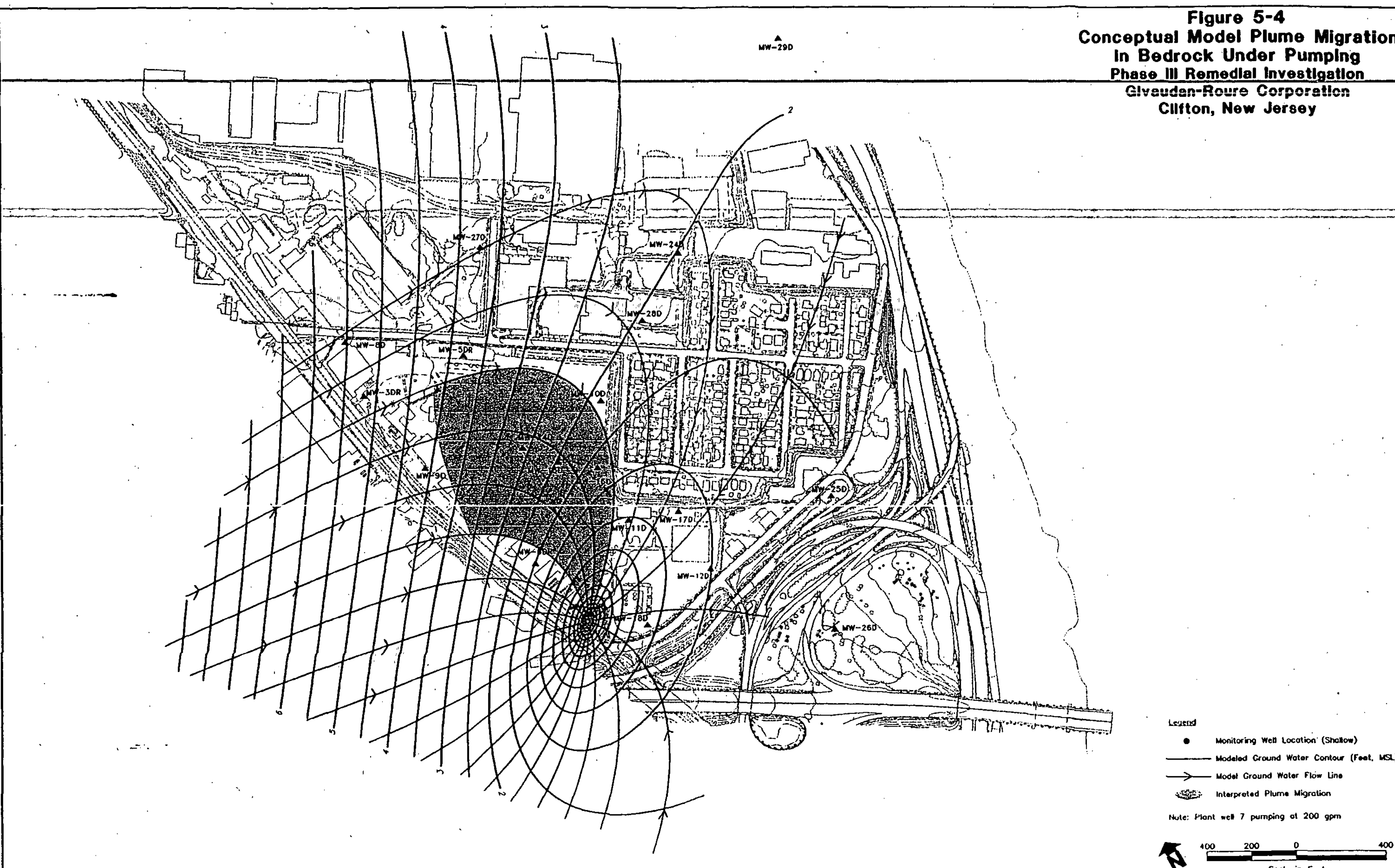
Figure 5-4
Conceptual Model Plume Migration in Bedrock Under Pumping
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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22321.20.01/07.11.98-MKB/07.14.98-CMP/A215-2C

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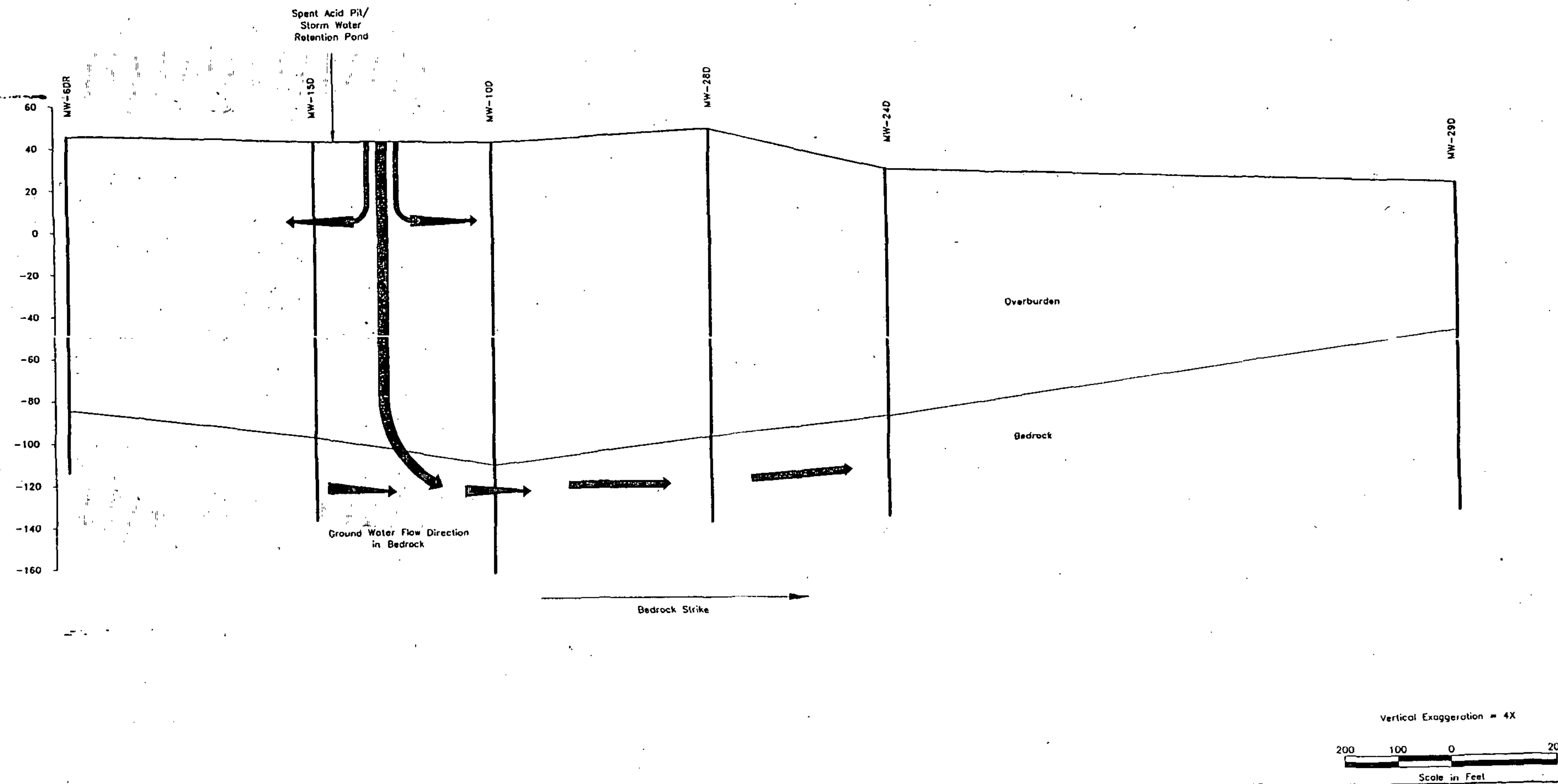
Figure 5-5
Conceptual Model
Under Static Conditions
Cross Section A A'
Givaudan-Roure Corporation
Clifton, New Jersey



ERM

22321.20.01/06.28.98-CMP/07.14.98-CMP/E202-1A

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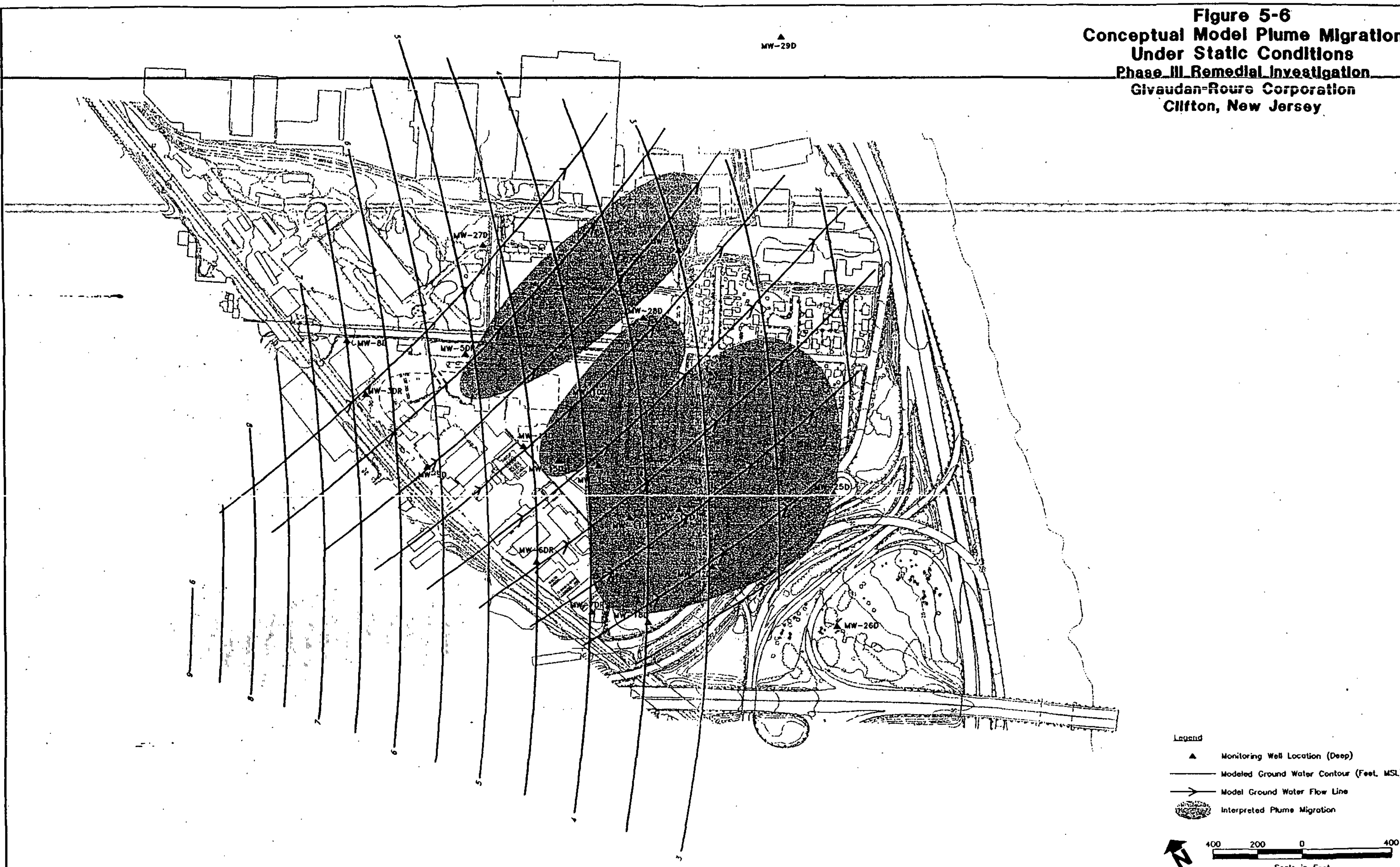
Figure 5-6
Conceptual Model Plume Migration Under Static Conditions
Phase III Remedial Investigation
Givaudan-Roure Corporation
Clifton, New Jersey



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22321.20.01/07.10.98-MKB/07.15.98-CMP/A214-2C

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6.0 CONCLUSIONS AND RECOMMENDATIONS

This section provides a discussion of the general conclusions and specific investigation area conclusions derived from the data obtained during the Phase III RI. The discussion in this section not only focuses on data obtained during the Phase III RI, but also incorporates significant findings developed from previous investigations, including the *Phase I Remedial Investigation* (ERM, 1988), Tank Closure Investigation, *Remedial Investigation for Soil* (ERM, 1997), and *Phase II Remedial Investigation for Ground Water* (ERM, 1997).

6.1 CONCLUSIONS

Based on the evaluations presented in this report, ERM has derived the following conclusions relative to the stated objectives of the Phase III RI. The conclusions are discussed in two sections: *6.1.1* ***General Conclusions*** which addresses the site in total and provides a holistic evaluation of the data from the site, and *6.1.2* ***Specific Conclusions*** which discusses specific areas of concern and the data from each of those areas.

6.1.1 *General Conclusions*

Based on the Phase I, II and III data, the following general conclusions have been developed:

(1) Two aquifers are present beneath the site (unconsolidated overburden and shallow bedrock). Ground water elevations collected during the Phase II RIGW and Phase III RI demonstrate that the ground water flows from northwest to southeast towards the Passaic River, discharging to the Passaic River.

(2) Recharge from the storm water retention pond results in ground water mounding of the shallow water table, yielding a radial flow pattern.

(3) Results from the pump tests performed during the 1988 RI demonstrate the strike parallel preferential flow direction in the Brunswick Formation (Section 4). Ground water demonstrates the effect of the anisotropy of the Brunswick Formation which alters the ground water flow to the northeast under both static and pumping conditions.

(4) Ground water modeling predicts that the bedrock aquifer discharges to the River, thus acting as a natural barrier for flow past the River.

(5) Volatile Organic Compounds (VOCs) were found to be the predominant constituents detected in ground water. The principal source areas for impacts to ground water are:

- Area A consisting of the old chemical sewer to the southwest of Building 84;
- Area B defined as the area which includes the old chemical sewer near boring WA-07, former Building 22 and 28 rows, and the botanical landfill;
- Area C consisting of the former spent acid pit and storm water retention pond and former maintenance building (Building 50);
- Area D defined as the former railcar off-loading and drum storage area near Building 69; and
- Area E defined to be the area adjacent to Building 82 where an accidental release from process equipment may have occurred.

(6) Semivolatile Organic Compounds (SVOCs) were detected in only 3 of 61 site monitoring wells at concentrations which are marginally greater than the Department's Ground Water Quality Standards (GWQSs). For the purpose of developing a site-wide Remedial Action Plan, SVOCs are not considered to be constituents of concern.

(7) The ubiquitous occurrence of several metals, the detection of metals at similar concentrations in well MW-23S upgradient of production areas, and the low frequency of metals detected above the Residential Direct Contact Soil Cleanup Criteria during the RIS, suggests that with a few exceptions metals detected in ground water are naturally occurring. Additionally, based on the absence of these metals at concentrations exceeding the GWQS in MW-25D, MW-26D, and MW-29D, located hydraulically downgradient of the plant, site-related metals detected at concentrations exceeding the GWQS are localized and do not impact the Passaic River. For the purpose of developing a site-wide Remedial Action Plan, metals are not considered to be constituents of concern.

(8) No potable water supply wells were identified within a 1-mile radius of the site.

6.1.2 *Specific Conclusions*

6.1.2.1 *Area A*

- A release from the old chemical sewer in the area southwest of Building 84 has resulted in impacts to ground water at this location. Primary constituents of concern in this area include toluene and xylenes.

- The data indicate that the lateral extent of the impacted areas in the unsaturated and saturated zones are localized. The vertical extent of impact to soil extends to ground water, thereby acting as a continuing source for impacts to ground water in the downgradient direction.
- The delineation of the source area yielding impacts to ground water in Area is well defined.

6.1.2.2 *Area B*

- A release from the old chemical sewer in the vicinity of former Tank T-56 has likely resulted in a continuing source for toluene and xylene to ground water. In addition, available data suggests the potential for impacts from laterals of the old chemical sewer adjacent to the former building rows 22 and 28.
- The former botanical landfill is considered to be a potential source area for organic constituents detected in the ground water.
- Based on ground water modeling, Area B is concluded to be the likely potential source for organic constituents detected in MW-24D.

6.1.2.3 *Area C (Former Spent Acid Pit and Storm Water Retention Pond)*

- The low concentrations of 1,2-DCA in ground water and soil indicate that 1,2-DCA was introduced into the ground water in an aqueous solution.
- The large volume of water that infiltrates through the storm water retention pond results in a continuous "flushing" of Area C. Thus, residual 1,2-DCA present in this location has been diluted to trace to very low levels in the immediate area of the historical source.
- Historical disposal of acidic waste in the spent acid pit has caused leaching of naturally occurring metals from the soil and bedrock in the immediate area. This has resulted in coprecipitation and adsorption of metals on iron and manganese-rich sediment as demonstrated by the significant decrease in concentrations of dissolved metals (filtered) compared to total metals (unfiltered). Therefore, only those wells which exceed the Ground Water Quality Standards in the filtered sample have been impacted by the historic operations of the spent acid pit.
- The sporadic distribution of impacted wells does not suggest a continuing source which contributes to dissolved metals in ground water. Rather, this distribution suggests a residual effect of the operation of the plant in general.

6.1.2.4 *Area D*

- The highest concentration of toluene detected during the Phase III RI was detected adjacent to Building 69 along the western property boundary. This location is consistent with the area where off-loading of railcars and drum storage occurred.
- The lateral extent of the dissolved toluene plume is very narrow and well defined. The length of the plume is not fully defined at this time.
- Based on the concentrations of toluene detected in soil, a definitive source area was not defined. However; toluene was detected in the soil in this area at concentrations of up to 3 mg/Kg. Toluene was not detected in soil samples in any other locations.

6.1.2.5 *Area E*

- Toluene detected in ground water in MW-6S and MW-7S is the result of a temporary operational change in Building 82 which resulted in an accidental release to the old chemical sewer or Building 82 sump,
- Hydrogeologic modeling and simple calculations confirm that toluene detected in wells MW-6S and MW-7S are related to the same incident.
- Ground water analytical data indicates the toluene has attenuated rapidly and has not migrated off-site.

6.2 *RECOMMENDATIONS*

It is concluded based on the available data that five potential source areas (Areas A, B, C, D, and E) for impact to ground water exist at the site. These source areas have been determined after extensive evaluation of soil and ground water quality at the site. Based on these findings, the following recommendations are made:

(1) As a preliminary step in developing a site-wide Remedial Action Plan additional investigation of Area B is required. Recently acquired information suggests this area may be a source area for organic constituents detected in MW-24D. In addition, to establish concentration gradients necessary to develop Classification Exception Area boundaries, two additional bedrock monitoring wells will be installed on the north side of Delawanna Avenue. The results of this supplemental investigation will be reported to the Department as soon as possible after the data is collected.

(2) A complete round of ground water samples from all existing and to-be-installed monitoring wells. The samples will be analyzed for VOCs, TAL metals (total and dissolved) and parameters necessary to

confirm conditions for intrinsic biodegradation (i.e., degradation compounds). This will provide the necessary data to evaluate natural attenuation as a potential remedial scenario.

(3) A site-wide Remedial Action Plan will be developed to address each impacted area. The Remedial Action Plan shall evaluate appropriate remedial alternatives, including No Further Action, for each area and provide a recommendation of the most appropriate alternative. An integral part of the Remedial Action Plan will be to report the results of the recently completed pilot study performed in Area A for in-situ chemical oxidation and the applicability to other areas of the plant.

(4) As appropriate, applications will be submitted for the dissolved phase plumes identified during the Phase III RI. The applications may include: (1) dissolved phase 1,2-DCA to the east of the plant; and (2) dissolved phase toluene to the west of the plant.

A contaminant fate and transport model will be constructed covering the two CEA areas using the fate and transport model, WinTran®. The fate and transport model will be used to simulate the plume attenuation process and estimate the time required for concentrations at certain locations to decrease below the GWQSs.

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7.0 REMEDIAL ALTERNATIVES EVALUATION

Based on the data presented in the Phase III RI, localized areas of impacted soil and ground water have been identified as the media of concern. It is concluded from the analytical data collected during the Phase III RI that the constituents of concern to be addressed under the Remedial Action Plan are VOCs, specifically chlorinated VOCs, and aromatic hydrocarbons (BTEX). Further evaluation of several recently identified areas of concern related to soil will be conducted and the results evaluated in the context of developing a Remedial Action Plan. Not withstanding the additional investigation to be completed, two specific areas of impact to soil will be addressed under the Remedial Action Plan: (1) Area A; and (2) the chemical sewer exfiltration point near Tank 56 in Area B. The presence of chlorinated VOCs and BTEX in ground water will be addressed as a separate area of concern.

On the basis of the constituents of concern present on the plant, a number of remedial technologies are available for consideration. These technologies can be divided into several categories:

(1) Source removal through excavation and disposal of impacted soils,

(2) Intrinsic biodegradation including natural attenuation and enhanced biodegradation of constituents in ground water,

(3) In situ Chemical Oxidation including oxygen releasing compounds, hydrogen releasing compounds of constituents in ground water,

(4) Air sparging/Soil Vacuum Extraction for treatment of source areas in soil and ground water,

(5) Pump and Treat systems for containment of dissolved phase plumes on the plant for treatment of soil and ground water.

The evaluation of potential alternatives will also include No Further Action based on the site-specific risk to human health and the environment presented by the conditions at the site. A No Further Action recommendation will likely include institutional and engineering controls to assure protection of human health and environment. The derivation of site-specific remediation objectives will be evaluated as part of the development of the Remedial Action Plan.

The selection of a remedial alternative for the plant will carefully consider and factor the potential future reuse of the plant into the decision making process. The final Remedial Objectives will be based on the future use of the property.

8.0 CERTIFICATIONS

Phase III Remedial Investigation for Ground Water
Givaudan-Roure Corporation
Clifton, New Jersey
June 1998

1. The following certification shall be signed by the highest ranking individual with overall responsibility for implementing the remediation of a site.

I certify under penalty of law that the information provided in this document is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Typed/Printed Name David B. Johnson **Title** Vice President, Environmental, Health & Safety Affairs

Signature DB Johnson **Date** 6-9-98

Company Givaudan Roure Corporation

Sworn to and Subscribed Before Me

on this ninth

Date of June 1998

Catherine Jeszenszky
Notary

CATHERINE JESZENSZKY
Notary Public State of New Jersey
My Commission Expires Dec. 4, 1999

2. The following certification shall be signed as follows:
   a. For a corporation, by a principal executive officer of at least the level of vice president.
   b. For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
   c. For a municipality, State, Federal or other public agency, by either a principal executive officer or ranking elected official.

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Typed/Printed Name David B. Johnson Title Vice President, Environmental, Health & Safety Affairs

Signature DB Johnson Date 6-9-98

Company Givaudan Roure Corporation

Sworn to and Subscribed Before Me

on this ninth

Date of June 1998

Catherine Jeszenszky
Notary

CATHERINE JESZENSZKY
Notary Public State of New Jersey
My Commission Expires Dec. 4, 1999

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9.0 *REFERENCES*

Chow, V. D., 1964. *Handbook of Applied Hydrology*. McGraw-Hill Book Company.

ERM, 1998. Revised Draft Remedial Investigation Report, prepared for Givaudan Corporation, Clifton, New Jersey.

Fetter, C.W, 1993. *Contaminant Hydrogeology*. Macmillan Publishing Company.

Fitts, C. R., 1994. *TWODAN* User's manual.

Freeze R.A and Cherry J.A, 1979. *Groundwater*. Prentice-Hall Inc.

Hinchee R.E., Leeson A., Semprini L., 1995. *Bioremediation of Chlorinated Solvents*. Battelle Press.

Norris, R.D. [et al.], 1994. *Handbook of Bioremediation*. CRC Press, Inc.

Michalski & Associates Inc., 1997. Remedial Action Report for Certified Metals Company-Clifton, New Jersey, prepared for Atlantic Coast Inc., Fort Pierce Florida.

Pankow J.F. and Cherry J.A., 1996. *Dense Chlorinated Solvents and other DNAPLs in Groundwater*. Waterloo Press.

Rose A.W., Hawkes H.E, and Webb J.S., 1991. *Geochemistry in Mineral Exploration*. Academic Press Inc.

Strack, O. D., 1989. *Ground Water Mechanics*. Prentice-Hall, Inc.

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23 June 1999
Reference: 22321.50.01

Ms. Maria Franco-Spera
Case Manager
Bureau of State Case Management
New Jersey Department of Environmental Protection
401 East State Street
CN048
Trenton, New Jersey 08625

RECEIVED
JUN 28 1999

RE: Givaudan Roure Corporation
100 Delawanna Avenue, Passaic County
Clifton, New Jersey Facility

Dear Ms. Franco-Spera:

As you are aware Environmental Resource Management (ERM), on behalf of Givaudan Roure Corporation (Givaudan Roure), has been completing investigative and remedial action work at the Clifton, New Jersey Facility (Facility). The Facility includes two portions, the Northern Parcel and the Southern Parcel, which are separated by Delawanna Avenue. This letter pertains solely to the Southern Parcel.

The purpose of this letter is to request a courtesy review of the work completed to date, followed by a meeting with your project team and management. Givaudan Roure and ERM request a meeting where we can discuss the basis for the planned remedial action discussed in this letter prior to preparing the Remedial Action Report (RAR) that will formally document the work performed to date and the selected remedy.

While the work has been completed in accordance with NJAC 7:26E, The Technical Requirements for Site Remediation (Technical Requirements), some conclusions drawn based upon sampling data needs to be confirmed with the Department before we finalize the planned remedial action and RAR. The Department's cooperation will benefit all interested parties since the Department will be fully aware of what will be contained in the RAR, so that review of the RAR can be completed in a timely manner.

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A summary of the work completed and data tables are included in the attachment with this letter. The attachment contains Plates and Figures showing the location of borings, areas of concern, and a presentation of the data. The work has included:

Active Remediation

- Removal of both old and new chemical process sewer lines, stormwater lines, sanitary sewer lines, catch basin, manholes and associated impacted soils;
- Removal of sediment and soil from the stormwater retention basin;
- Removal of four inactive cesspools discovered during the sewer excavation;
- Removal of soils from an abandoned turn-of-the-century foundry discovered during sewer line excavation; and
- Removal of 47 underground storage tanks; five more will be removed during the demolition activities.
- To date, approximately 15,000 yds^3 of soil have been removed and disposed offsite.

Investigation

- Continued investigation of soil and shallow ground water in the four areas of concern (Areas A, B, C, and D) previously identified to the New Jersey Department of Environmental Protection (NJDEP); and
- A fifth area of concern was identified, as a result of sampling soils beneath the building pads that were used in active production as required by the Industrial Site Redevelopment Act (ISRA).

A brief summary of each area of concern is presented, followed by the preferred remedial alternative. The specific items we need to jointly review are presented at the end of the letter.

Description of Areas of Concern

Plate 1 in the attachment identifies the Southern Parcel, sample locations, monitoring wells, and the areas of concern (A, B, C, D and building areas) at the Facility.

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Area A

Area A is approximately 44,800 square feet and covers an area approximately 280 feet in length and 160 feet in width. The longitudinal axis of the area is oriented parallel to Delawanna Avenue (northwest to southeast), offset approximately 140 feet southwest from the center line of Delawanna Avenue.

Area A is characterized by the presence of two probable historic contaminant source areas shown on Plate 3:

(1) An exfiltration zone in the "old chemical sewer" (removed in 1998) which has resulted in impacts to soil and ground water in the north corner of Area A (referred to as AOCA-1); and

(2) Four cesspools (removed in late 1998/early 1999) located in the south corner of Area A (referred to as AOCA-2).

The primary constituents of concern in soil and ground water in Area A are chlorinated volatile organic compounds (VOCs), including tetrachloroethene, trichlorethene, 1,2-dichloroethene, 1,2-dichloroethane, and vinyl chloride and toluene. A free product toluene plume exists on the shallow ground water in this area as well as some residual product in the vadose zone.

It should be noted that the terms free product and residual product used in this letter are consistent with the definition of free product and residual product found in 7:26E-1-8.

Area B

Area B is defined as an area of approximately 100,000 square feet bounded to the north by Delawanna Avenue, to the west by Area A and Building 89, to the south by Building 200, and to the east by former Building 72. Area B includes the former production buildings identified as Building 20, 25, 28, 29, 30, 31 (A, B, C, D, and E) and 32.

The primary constituents of concern in soil and ground water in Area B are VOCs, including acetone, dichloromethane, bromodichloromethene, methylene chloride, carbon tetrachloride, tetrachloroethene, 1,2-dichloroethane, vinyl chloride and benzene, toluene, ethylbenzene, and xylenes (collectively BTEX). Metals, copper, arsenic and lead are also

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considered as constituents of concern in Area B. The following semi-volatile organic compounds (SVOCs), 2,4-dinotrotoluene, dimethylpthalate, fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, benzo(b)fluoranthene, and benzo(a)anthracene are present. A residual product primarily consisting of Tertiary Butyl Toluene was identified in the northeast portion of Area B.

Area C

Area C is defined as an area of approximately 19,200 square feet, including the Spent Acid Pit (SAP) and Stormwater Retention Pond (Pond). The SAP is roughly rectangular in shape with approximate dimensions of 240 feet x 80 feet. The Pond was in operation for more than 58 years until its closure in January of 1999. During operation, the Pond received stormwater from the roof drains and overland flow through the storm sewer system. The Pond prior to closure and excavation in 1999 was approximately 50 feet in diameter and 15 feet in depth.

Analytical data indicate that the SAP and Pond may be potential source areas for organics and metals detected in the ground water at the Facility. Three different residual products referred to as C-1, C-2 and C-3 are found in Area C above the shallow water table. A physical description of these materials is provided in Table A-1 in Appendix A.

Area D

Area D encompasses approximately 5,600 square feet and contained a former drum storage area located along the west property boundary. Area D is approximately 140 feet in length and 40 feet in width, with the longitudinal axis oriented parallel to the railroad tracks at the property boundary.

The primary constituent of concern in Area D is the presence of toluene in ground water. There are no exceedences in the soil in this area above the non-residential direct contact soil criteria (NRDCSCC) or the impact to ground water soil criteria (IGWSCC).

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Soils Under Building Slabs

This area, referenced as the "Building Area", occupies the west half of the Facility, where a majority of the buildings used in production were located. It also includes the other process buildings on the Facility, i.e., 7, 9, 50 89, and 72. The buildings were investigated as part of the ISRA site investigation requirements.

The constituents of concern in the soils under building slabs include one or more VOCs, SVOCs, and metals, and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD).

Preferred Remedy

Remedial Action Objectives

In accordance with 7:26E-5: Remedial Action Selection of the Technical Requirements, Givaudan Roure has identified the Remedial Action Objectives (RAOs) for soils at the facility.

Active treatment and removal versus containment and exposure controls, (Permanent versus Non-permanent remedial action) were considered during the evaluation of remedial alternatives.

The RAO's are based on previous investigations and potential risks to the public health, welfare, and the environment posed by the impacted soils. The RAOs for the Facility are:

- Mitigate potential risks due to direct contact of impacted soils;
- Mitigate potential impact to the ground water from the impacted soils or residual materials in the soil profile;
- Remove 2,3,7,8-TCDD impacted soils having concentrations greater than 2 ppb in the 0 to 12 foot soil profile;
- Remove free product to the extent technically feasible (as demonstrated by field pilot study); and
- Establish a Deed Notice for those areas that encompass soils impacted above the more stringent of the IGWSCC and NRDCSCC and are bounded by areas that are less than the RDCSCC.

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Remedial Action Alternative Evaluation

In accordance with the Technical Requirements Selection, Givaudan Roure has evaluated remedial action alternatives to address the impacted soils at the Facility. The remedial action alternatives were evaluated on their ability to achieve the remedial action objectives identified above, and were also evaluated using the following selection criteria as stated in the Technical Requirements:

- Potential risk to public health and safety and the environment;
- Implementability of the proposed remedial action;
- Applicable federal, state, and local laws and regulations;
- Potential impacts on the local community;
- The degree of permanence of the remedial action; and
- Potential natural resource injury.

Proposed Remedy

For the areas on the Southern Parcel where constituents of concern will remain in soil at concentrations exceeding either the NRDCSCC or IGWSCC of the NJDEP Soil Cleanup Criteria: the preferred remedy is an institutional control in the form of a deed notice restricting use for an area shown in Plate 2 and engineering control in the form of capping for the same identified area. No further active remediation or excavation of soils exceeding the NRDCSCC or IGWSCC will be proposed for soil AOCs on the Southern Parcel. Within Area A and Area B where free product and residual product occur at the water table, active remediation will be done to the extent technically feasible (as demonstrated by a full pilot study).

For areas of shallow ground water contamination natural attenuation is the preferred remedy.

A Well Restriction Area (WRA) preventing use of ground water for any purpose, potable or non potable, is proposed to be placed on both the shallow and deep ground water on the Southern Parcel, and off-site areas.

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Classification Exception Areas (CEAs) will be placed on the Southern Parcel:

- Dissolved volatile organic compounds (VOCs) plume in Area A containing benzene, tetrachloroethene, perchloroethene, trichloroethene, 1,2-dichloroethene, 1,2-dichlorethane (1,2-DCA) and vinyl chloride. The approximate dimensions of this CEA will be 400 feet in length, 200 in width and will be oriented approximately northwest to southeast as shown on Plate 2 and apply to the shallow aquifer;
- Dissolved volatile organic plume in Area B in the shallow acquifer containing benzene, toluene, ethylbenzene, 1,2-DCA, PCE, acetone, dichloromethane, bromodichloromethane, methylene chloride and xylenes in Area B in the shallow aquifer. The dimensions of this plume have yet to be established;
- Dissolved toluene plume in Area D in the shallow aquifer. The approximate dimensions of this CEA will be 700 feet in length and 200 in width and will be oriented approximately northeast to southwest as shown on Plate 2; and
- Dissolved VOC plume in the bedrock aquifer containing 1,2-dichloroethane encompassing the entire Southern and Northern Parcels and off-site areas.

Implementation of the preferred remedy and completion of investigative and remedial work at the facility is contingent on the NJDEP's concurrence with the following interpretations:

Dioxin Removal

After careful review of documents related to the previous investigation and remediation of soil containing 2,3,7,8-tetrachlorodibenzo-p dioxin (Dioxin) Givaudan Roure was, at that time, permitted by the NJDEP to contain in place soil with Dioxin concentrations less than 20 parts per billion (ppb) as referenced in the attached letter from the NJDEP to Givaudan Roure (1991). Considering the perceptions related to Dioxin and the fact Givaudan Roure previously remediated Dioxin at the Facility, we plan to excavate and dispose of soil containing Dioxin greater than 2 ppb up to a depth of 12 feet below current grade. This will be for a defined volume of soil, and since Givaudan Roure has delineated

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to a concentration of 1 ppb and no soil samples in the area exceed 20 ppb, no post-excavation sampling is planned. The installation of the engineering and institutional controls will be proposed to complete the remedy.

Delineation of Soil Exceedences

Soil data has been compared to the more stringent of either the NonResidential Direct Contact Soil Cleanup Criteria (NRDCSCC) or the Impact to Groundwater Soil Cleanup Criteria (IGWSCC). Exceedences of these criteria exist at the boundaries of the areas of concern. Further horizontal delineation will lead to borings that will co-mingle between areas. Considering the age of the facility and results to date we do not believe we can confidently identify a "clean" boundary between areas. Also, vertical delineation of compounds has not been completed in all areas, and we are finding the occurrence of vertical delineations is random and not clearly attributable to a specific source.

Since known sources have been, or will be, removed, there is a low probability of compounds of concern continuing to migrate through the soil column. Also, since the intent is to cap a majority of the property, the probability of continued migration through the soil column is even lowered. In addition, it should be noted that the most recent ground water sampling event is showing decreased contaminant concentrations compared to historical data. Therefore, based on the fact source removal will be completed, and the preponderance of data provides a clear understanding of the location and distribution of compounds above standards remaining in the soil, we request a variance from the need to complete further horizontal and vertical delineation of compounds of concern.

Variance Argument

Residual Product

Within Area A, B, and C we have defined residual product in the soil matrix as described in the Area Summaries and in the Attachment. The type, amount and location of the residual product is different in each area. However, there is no clear indication that these residual products are continuing to affect the ground water, since the related source of each of these materials is gone, and each area will be within a deed restricted area and capped.

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Within Area A residual product is encountered in soil borings directly above the water table. Free product on the water table has only been found in one (MW-22) of the four wells installed in this area, and at less than 3 inches (actual measurement). The occurrence of free product even in this one well is also inconsistently detected and is dependent on water levels. The residual, and free product, are toluene which is aggressively acted on by natural organisms resulting in natural attenuation of the material.

Within Area B there is a residual product in the soil directly above the water table as defined by soil borings and a monitor well. Laboratory analysis of this material indicates it is composed predominately of Tertiary Butyl Toluene. The source of this material is believed to be from an Aboveground Storage Tank (AST) and the chemical sewer in this vicinity, both of which have been removed.

Within Area C, three different types of residual product are found. Two are found above the bottom of an excavation primarily used for disposal. The third is found in soils below the bottom of this excavation. All materials are more than 10 feet above the water table.

We propose to leave the residual material in Area C in place. Active remediation of the free and residual product in Areas A and B will be attempted by a pilot study to determine the technical feasibility of actively remediating the material. Since the source of these materials in Areas A and B has been removed, there is no indication they continue to impact ground water, and they will be included within the Deed Notice area and capped.

Deed Notice Boundary

We understand it is a requirement to provide documentation that there are no exceedences of the Residential Direct Contact Soil Cleanup Criteria (RDCSCC) at the property boundary, and outside of the Deed Notice Area. This information will be provided in the final RAR.

There is one area of the Facility where we believe the RDCSCC may not be attainable. Along the northwestern property line there are exceedences of the NRDCSCC for semi-volatile compounds in the 0-2 foot interval, and deeper at select locations. At the property boundary

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Resources
Management

exists active rail road lines owned and operated by the New Jersey Transit Authority. Also, historically coal piles were placed in this area; the coal was used for fuel for the boiler located in the building. Should we collect additional samples in this area we fully expect to encounter semi-volatile compounds in soil samples. Should these data show exceedences of the RDCSCC we propose to place a Deed Notice on this area noting the exceedences, but do not propose to complete additional delineation sampling off the Facility property and onto active rail lines.

We would appreciate the Departments' review of this letter and the attachment and request a meeting date as soon as possible in July 1999. Should the information suffice to approve in concept a Deed Notice, cap and CEA/WRA as the remedy for the Facility, acknowledgement of such would be appreciated. The Departments' co-operation with this important matter will help return this site to productive use in a timely manner. Please contact Mr. Dave Johnson (973-439-2122), or Mr. Gene Thomas (973-439-2123) of Givaudan to set the meeting. Thank you.

Sincerely,

Rick Wroblewski

Richard T. Wroblewski, P.G.

RTW/sd
enclosures: APPENDIX A
cc: Dave Johnson, Givaudan Roure
Gene Thomas, Givaudan Roure
Ron Fender, ERM
Mike Eversman, ERM

Appendix A
Summary of Investigations and Historic Data

Table A-2 Summary of Exceedences of Soil Cleanup Criteria Beneath Buildings

Building No.	VOCs	SVOCs	Metals	NRDCSCC	IGWSSC
7	X	X			10 to 12 feet
9	X	X	X	10 to 12 feet	6 to 7 feet
RDS 40		X	X	6 to 6.5 feet	
50	X	X	X	1 to 1.5 feet	3.5 to 4 feet
57	X	X		0 to 2 feet	5 to 6 feet
60	X	X			5.5 to 6 feet
68A	X	X			10 to 12 feet
79	X	X			10 to 12 feet
80	X	X			15 to 16 feet
82	X	X		0 to 2 feet	5 to 6 feet
92	X	X		5 to 6 feet	9 to 10 feet
93	X	X		10 to 12 feet	10 to 12 feet
94	X	X		0 to 2 feet	0 to 2 feet
95	X	X			10 to 12 feet
200	X	X			9 to 10 feet

A.7.2 Results of Analysis for 2,3,7,8-TCDD

A.7.2.1 Building 95

The initial Building 95 borings, SB95-1 to SB95-14, are shown on the Building 95, Plate 16. Based on the analytical results from these boring samples, additional borings (SB95-8-1 to SB95-8-17) were placed and are also shown on Plate 16. The additional borings were installed at 5-foot, 10-foot and 15-foot radial distances around the locations of known exceedence to delineate the horizontal and vertical extent of 2,3,7,8-TCDD in soils.

Boring SB95-8 has concentrations greater than 2 ppb at depth intervals 10-11 feet, and 23-24 feet. Of the delineation borings, concentrations greater than 2 ppb were found in SB95-8-3, SB95-8-5, and SB95-8-14. The exceedences occurred at a depth of 0 to 2 feet in SB95-8-3, at a depth of 0 to 2 feet and 5 to 6 feet in SB95-8-5 and at a depth of 0 to 2 feet in SB95-8-14.

Table A-3 summarizes results greater than 1 ppb for 2,3,7,8-TCDD in Building 95.

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Table A-3 Summary of 2,3,7,8-TCDD Results Greater than 1 µg/Kg Building 95

Sample Identification	Sampled Interval (ft bgs)	2,3,7,8-TCDD Concentration
SB95-8	0 to 2	1970E
	5 to 6	1510E
	10 to 11	7,170E
	15 to 16	1,450E
	18 to 20	78.7
	23 to 24	2,030E
	26 to 27	18.9
SB95-8-1	0 to 2	1,800E
	5 to 6	477E
	10 to 12	720E
SB95-8-2	0 to 2	1,840E
	5 to 6	15.4
	10 to 12	34.8
SB95-8-3	0 to 2	14,350E
	5 to 6	13.5
	10 to 12	389
SB95-8-4	0 to 2	1,410E
	5 to 6	1,230E
	10 to 12	528E
SB95-8-5	0 to 2	2,310E
SB95-8-5D	0 to 2 (duplicate)	2,530E
	5 to 6	2,280E
	10 to 12	1,230E
	14 to 16	288
	18 to 20	31.2
	22 to 24	284
SB95-8-13	0 to 2	1,050E
	5 to 6	30.8
	10 to 12	12.6
	14 to 16	0.4
	18 to 20	0.71J
	23 to 23.5	0.1
	27 to 27.5	0.1
SB95-8-14	0 to 2	3,010E
	5 to 6	133
	10 to 12	1.2
SB95-8-14D	10 to 12 (duplicate)	2.1
	14 to 16	11.5
	18 to 20	0.89J
	23 to 23.5	9.6
	27 to 27.5	1.1

Notes
1. Concentrations reported in parts per trillion
2. Values with "E" qualifier exceed calibration range and are reported as Estimated Maximum Probable Concentration

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A.7.2.2 *Building 93*

Sample locations in Building 93 are shown on Figure 9. The table summarizes the results above 1 ppb for 2,3,7,8-TCDD under Building 93. Eight borings in Building 93, SB93-1 to SB93-8, were installed to collect dioxin samples. Additional delineation borings were installed around SB93-3 (SB93-3-1 to SB93-3-8) at 5-foot and 10-foot radial distances to further delineate the horizontal and vertical extent of 2,3,7,8-TCDD in the soil. Building 93 sample locations are shown on Figure 9.

2,3,7,8-TCDD was detected at concentrations greater than 2 ppb in SB93-3 at depth intervals of 0 to 2 feet and 5 to 6 feet and in SB93-1 at a depth interval of 0 to 2 feet. 2,3,7,8-TCDD was not detected in the delineation samples around SB93-3 at levels greater than 2 ppb. Table A-4 summarizes the results greater than 1 ppb.

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Table A-4 *Summary of 2,3,7,8-TCDD Results Greater than 1 μg/Kg Building 93*

Sample Identification	Sampled Interval (feet below ground surface)	2,3,7,8-TCDD Concentration
SB93-1	0 to 2	16,200
	5 to 6	2.5
SB93-2	0 to 2	1,480
	5 to 6	0.4
SB93-3	0 to 2	13,590
	5 to 6	18,790
	9 to 10	15.2
SB93-8	0 to 2	1,210E
	5 to 6	
		0.9
SB93-3-1	1.5 to 2	1,861E
	4 to 4.5	213
	8 to 8.5	158
SB93-3-2	1 to 1.5	1,016E
	4 to 4.5	8.6
	8.5 to 9	20.1
SB-93-3-4	1 to 1.5	900
	1 to 1.5D	1,272 (duplicate)
	4 to 4.5	1972
	8.5-9	111.1
SB93-3-5	1.5 to 2	1,390
	4 to 4.5	251

Notes
1. Concentrations reported in parts per trillion
2. Values with "E" qualifier exceed calibration range and are reported as Estimated Maximum Probable Concentration

A.7.2.3 *Building 168*

Sample locations in Building 168 are shown on Figure 10. A summary of results greater than 1 ppb are shown in Table A-5. Nine initial borings were placed in Building 168, SB168-1 to SB168-9. Further vertical and horizontal delineation borings were placed around SB168-7 at a 5-foot radial distance. Building 168 sample locations are shown on Figure 10.

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At SB168-7, 2,3,7,8-TCDD was detected at a concentration greater than 2 ppb between 0 and 2 feet. 2,3,7,8-TCDD was not detected in the delineation samples at concentrations greater than 2 ppb. Table A-5 summarizes results detected above 1 ppb.

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EXECUTIVE ORDER NO. 40C

WHEREAS, Executive Order No. 40 was signed on June 2, 1983 to declare an emergency for the possible dioxin contamination of a site located at 80 Lister Avenue in the City of Newark; and

WHEREAS, that emergency was extended by Executive Order No. 40A, signed on June 14, 1983 to cover the possible dioxin contamination of another site, located at 30 Whitman Avenue, in the Township of Edison; and

WHEREAS, that emergency was further extended by Executive Order No. 40B, signed on June 17, 1983 to cover the possible dioxin contamination of another site, located at 125 Delawanna Avenue, in the City of Clifton, County of Passaic; and

WHEREAS, the preliminary investigation, sampling, and analysis of soil samples at certain property located in Building No. 8 at 100 West Main Street in the Borough of Bound Brook, County of Somerset, and more particularly known as the former Blue Spruce International, Inc facility, has indicated detectable levels of dioxin present at certain areas on that property; and

WHEREAS, further investigations, samplings, and analyses are necessary in order to determine definite information as to the nature and extent of any danger which may be posed by the possible dioxin contamination at the above described premises and in the immediate vicinity thereof in order to determine what actions if any will be required to safeguard the public health and welfare; and

WHEREAS, this situation warrants on extension of the declaration of emergency as set forth in Executive Order

WHEREAS, the scope of the efforts necessary to so protect the public health and welfare is beyond the capacity of regular municipal operating services, or any State agency acting singly.

NOW THEREFORE, I, Thomas H. Kean, Governor of the State of New Jersey, by virtue of the authority vested in me by the constitution and laws of the State of New Jersey, do hereby amend Executive Order No. 40 and follows:

1. Continue in full force and effect Executive Order No. 40, and all terms and provisions thereof.

2. Executive Order No. 40 is amended to include the former Blue Spruce International premises located in Building No. 8 at 100 West Main Street in the Borough of Bound Brook, as described above.

3. This Order shall take effect immediately. It shall remain in effect until terminated or amended by action of the Governor.

GIVEN, under my hand and seal this 27 day of June, in the year of Our Lord, one thousand nine hundred and eighty-three, and of the United States, the two hundred and seventh.

THOMAS H. KEAN, Governor

Attest: Michael L. Cole

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STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROBERT E. HUGHEY, COMMISSIONER
CN 402
TRENTON, N.J. 08625
609-292-2885

ADMINISTRATIVE ORDER NO. EO

WHEREAS, Governor Thomas H. Kean has issued Executive Order No.   declaring that a state of emergency exists arising from the potential dioxin contamination of the premises at 125 Delawanna Avenue, in the City of Clifton, New Jersey; and

WHEREAS, by said Executive Order the Governor has authorized and directed me to take such emergency measures as I may determine to be necessary in order to fully and adequately protect the health, safety and welfare of the citizens of this State from any actual or potential threat or danger which may exist as a result thereof; and

WHEREAS, preliminary test results have indicated detectable levels of dioxin present at portions of the site of the Givaudan Corporation at 125 Delawanna Avenue, in the City of Clifton, New Jersey and:

WHEREAS, it is necessary to take additional measures to protect the public health, safety and welfare while further information is obtained;

NOW, THEREFORE, pursuant to the powers vested in me by Executive Order No.   , I hereby Order and Direct that the Givaudan Corporation immediately implement the following measures, at its expense, under the supervision and direction of this Department and the U. S. Environmental Protection Agency:

(1) All areas where preliminary test results have indicated the presence of dioxin at or in excess of one (1) part per billion shall be closed and secured, with physical access thereto restricted. All such areas should be covered by a permeable ground cover installed by a contractor approved by representatives of the Department and the U. S. Environmental Protection Agency in such manner and location as may be directed by those representatives.

(2) All hexachlorophene production shall be suspended until further notice by the Department. Those areas of the facility which are associated with the hexachlorophene production process, as determined by the Department, shall be closed and secured with physical access thereto restricted. No hexachlorophene shall be moved into or from these areas or any other area of the 125 Delawanna site.

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100% Recycled

(3) Commencing June 18, 1983, on-site sampling of interior and exterior areas of the 125 Delawanna Avenue facility shall be conducted by a contractor approved by representatives of the Department and the U. S. Environmental Protection Agency, in such manner and location as may be directed by those representatives.

(4) No hazardous or chemical waste shall be removed from the 125 Delawanna Avenue site until further notice by the Department. No materials or substances containing Trichlorophenol shall be moved onto, about or from the 125 Delawanna Avenue site until further notice by the Department.

(5) No demolition, excavation, movement or disturbance of soil, or placing, movement or removal of construction materials or equipment shall occur and 125 Delawanna Avenue site until further notice by the Department.

(6) All medical and personnel records, reports and other information shall be provided as requested by the Commissioner of the N. J. Department of Health.

(7) Appropriate health screening and evaluation programs, including but not limited to employee medical examinations, shall be implemented as directed by the Commissioner of the N. J. Department of Health.

(8) Any other precautionary or remedial action shall be implemented as may be directed by this Department, the N. J. Department of Health, or the U. S. Environmental Protection Agency.

This Order shall take effect immediately.

WITNESS: Michael F. Catania

Robert E. Hughey
ROBERT E. HUGHEY
Commissioner

6/17/83
DATED

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Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RICHARD T. DEWLING, Ph.D., P.E.
COMMISSIONER
CN 402
TRENTON, N.J. 08625
609-292-2885

IN THE MATTER OF : ADMINISTRATIVE
GIVAUDAN CORPORATION : CONSENT ORDER
: GROUND WATER

The following FINDINGS are made and ORDER is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter the "Department") by N.J.S.A. 13:1D-1 et seq., by the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., by the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and by the Spill Compensation and Control Act, N.J.S.A. 58:10-23 et seq.

FINDINGS

1. Givaudan Corporation (hereinafter "Givaudan") owns and operates an office, manufacturing, packaging, storage, shipment and research complex on 31.43 acres on Delawanna Avenue, Clifton, New Jersey (hereinafter the "Givaudan Plant") which currently has approximately 685 employees and has been assessed by Clifton for 1984 real estate tax purposes at $9,597,700. The Givaudan Plant includes a chemical manufacturing facility located to the south of Delawanna Avenue, at 125 Delawanna Avenue (Block 73-3, Lot 2) (hereinafter the "Site").

2. The Site is bordered on the northeast by Delawanna Avenue, on the southwest by New Jersey State Route 3, on the northwest by CONRAIL commuter and freight railroad lines, and on the southeast by a small, medium-density housing community which is located on a bluff overlooking the Site. The Passaic River, which forms the boundary between Passaic and Bergen Counties in the area of the Site, is approximately one-third of a mile to the southeast of the Site and is believed to be tidally influenced in the area of the Site. The Site is located in an area of Clifton which has been industrialized for many years.

3. The Site is believed to have been an active industrial site since approximately 1905. The bulk of the Site was owned by Antoine Cheris prior to its purchase by Givaudan in 1913. The remainder of the Site was purchased by Givaudan in 1926 from National Anode Corporation and in 1931 from Capes-Viscose Corporation.

4. Since approximately 1913, Givaudan has manufactured a variety of aromatic chemicals at the Site.

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5. Since approximately 1950, Givaudan has continuously extracted ground water at the Site at the rate of approximately 1 million gallons per week. The extracted water has been utilized for non-contact cooling water and has been discharged to the facilities of the Passaic Valley Sewerage Commission, a publicly owned treatment works.

6. In April, 1985, Givaudan completed installation of a new, state-of-the-art chemical process sewer system with secondary containment. The new system consists of a series of pipes constructed within concrete trenches which serve to contain any potential leaks. Gratings over the trenches permit physical inspection to detect leaks. The new system is designed to prevent the future risk of ground water contamination from leaking chemical sewers.

7. Although the ground water underlying the Site has been sampled for contamination on various occasions in the past, the nature and extent, if any, of ground water contamination underlying the Site and the surrounding area, from the operations of Givaudan or otherwise, remains to be delineated.

8. Past sampling of ground water underlying the Site has disclosed the presence of various contaminants including 1,2-dichloroethane, 1,1,2-trichloroethane, toluene and benzene.

9. Concurrently with the issuance of this Administrative Consent Order, the Department has also issued, with the consent of Givaudan, another administrative consent order, entitled "In the Matter of Givaudan Corporation Administrative Consent Order-TCDD" (hereinafter the "TCDD Consent Order"), covering the investigation, delineation and remediation of 2,3,7,8-Tetrachlorodibenzo-p-dioxin contamination at the Site.

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED AND AGREED THAT:

I.

Ground Water Remedial Investigation and Feasibility Study

10. Within sixty (60) days after the effective date of this Administrative Consent Order, Givaudan shall submit to the Department for its review and approval, a detailed draft work plan (hereinafter the "RI Work Plan"), to conduct a ground water remedial investigation (hereinafter "RI") based on the scope of work set forth in Appendix A, Section I, which is attached hereto and made a part hereof.

11. Within fifteen (15) days after receipt of the Department's written comments on the draft RI Work Plan, Givaudan shall modify the draft Work Plan as necessary to conform to the Department's comments and shall submit the modified RI Work Plan to the Department.

12. Within one hundred eighty (180) days after receipt of the Department's written approval of the Work Plan, Givaudan shall conduct and complete the RI and submit a draft ground water investigation report (hereinafter the "Investigation Report") to the Department for its review and approval, provided, however, that the parties agree that Givaudan shall not be required to install any new wells in a known or suspected TCDD contaminated area until the TCDD is removed.

13. Within fifteen (15) days after receipt of the Department's written comments on the draft Investigation Report, Givaudan shall modify the draft Investigation Report as necessary to conform to the Department's comments and shall submit the modified Investigation Report to the Department for its approval, or initiate such additional investigations as may be found necessary by the Department, in accordance with a schedule established by the Department.

14. Within thirty (30) days after the approval by the Department of the Investigation Report, Givaudan shall submit to the Department for its review and approval, a draft work plan to conduct a feasibility study of remedial action alternatives for contamination at and/or emanating from the Site (hereinafter, the "FS Work Plan"), based on the scope of work set forth in Appendix A, Section II, which is attached hereto and made a part of hereof.

15. Within fifteen (15) days after receipt of the Department's written comments on the draft FS Work Plan, Givaudan shall modify the draft FS Work Plan as necessary to conform to the Department's comments and shall submit the modified FS Work Plan to the Department for its approval.

16. Within sixty (60) days after receipt of the Department's written approval of the FS Work Plan, Givaudan shall prepare and submit a draft ground water FS report pursuant to the FS Work Plan, to the Department for review and approval.

17. Within thirty (30) days after receipt of the Department's written comments on the draft FS report, Givaudan shall modify the draft FS report as necessary to conform to the Department's comments and shall submit the modified FS report to the Department for approval.

18. Within sixty (60) days after receipt of the Department's written selection of a ground water remedial action alternative, Givaudan shall submit to the Department for its review and approval, a detailed draft ground water remedial action plan (hereinafter the "Remedial Action Plan"), including a complete cost estimate and an implementation schedule to implement the selected alternative, pursuant to the Work Plan.

19. Within thirty (30) days after receipt of the Department's written comments on the draft Remedial Action Plan, Givaudan shall modify the draft Remedial Action Plan as necessary to conform to the Department's comments and shall submit the modified Remedial Action Plan to the Department for its approval.

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20. Upon receipt of the Department's final written approval of the Remedial Action Plan, Givaudan shall implement the Remedial Action Plan in accordance with the approved time schedule.

II
Project Coordination

21. All documents required by the terms of this Administrative Consent Order to be submitted by Givaudan to the Department, and all comments or approvals to be provided by the Department to Givaudan pursuant to the terms of this Administrative Consent Order, as well as all non-routine correspondence, including correspondence relating to force majeure issues, shall be sent by certified mail, return receipt requested, or shall be hand delivered and duly receipted by the recipient.

22. All correspondence, reports, work plans and other writings submitted to the Department by Givaudan with respect to this Administrative Consent Order shall be sent unless otherwise instructed by the Department to:

Karen Jentis, Chief
Bureau of Case Management
Division of Hazardous Waste Management
CN-028
Trenton, New Jersey 08625

23. Written communications from the Department to Givaudan with respect to this Administrative Consent Order shall be sent to:

Dr. H. A. Brandman
Vice-President-Manufacturing
Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

A copy of all such written communications shall be sent to:

William H. Hyatt, Jr., Esq.
Pitney, Hardin, Kipp & Szuch
163 Madison Avenue
CN 1945
Morristown, New Jersey 07960-1945

24. Within seven (7) days after the effective date of this Administrative Consent Order, Givaudan shall provide the Department with the name, title, address and telephone number of its designated Facility Coordinator, who shall be responsible for oversight on behalf of Givaudan of the implementation of this Administrative Consent Order, including all activities required herein. Givaudan shall have the right to change its Facility Coordinator at any time, provided Givaudan shall notify the Department in writing at least five (5) working days prior to any such change. If such advance notice is not feasible, notice shall be given to the Department by the best means and as far in advance as possible under the circumstances.

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25. Givaudan shall allow the Department and its authorized representatives access to the Site at all times for the purpose of monitoring compliance with the terms of this Administrative Consent Order.

III

Financial Requirements

A. Insurance

26. Givaudan shall use its best efforts to secure and maintain in force during the pendency of this Administrative Consent Order, a comprehensive general liability insurance policy with coverage as broad as the standard coverage form currently in use in the State of New Jersey which shall not be circumscribed by the endorsements limiting the breadth of coverage. The policy shall include an endorsement (broad form) for contractual liability, an endorsement for completed operations liability, an endorsement of Broad Form Property Damage Coverage and an endorsement for independent contractors coverage. Givaudan shall use its best efforts to have its underwriter(s) add and maintain the State of New Jersey as an additional insured through completion of the Remedial Action Plan to be implemented pursuant to this Administrative Consent Order. The policy shall be specifically endorsed to eliminate any exclusions for explosion, collapse and underground hazards (x,c,u). Limits of liability shall be not less than Six Million Dollars ($6,000,000.00) per occurrence and annual aggregate for bodily injury and for property damage combined.

27. If Givaudan is able to obtain the insurance policy described in paragraph 26 above, as soon thereafter as the insurance policy can be obtained by Givaudan, Givaudan shall provide the Department with a current certificate of insurance certifying coverage. The certificate shall contain a provision that the insurance shall not be cancelled for any reason except after thirty (30) days written notice to the Department.

28. If Givaudan is not able to obtain, or maintain the insurance policy described in paragrah 27 above, Givaudan shall indemnify the State to the same extent that the insurance coverage would have provided the State as an additional insured.

B. Financial Assurance

29. Within thirty (30) days after the effective date of this Administrative Consent Order, Givaudan shall obtain and provide to the Department an irrevocable, conditional letter of credit in the amount of One Million Dollars ($1,000,000) (hereinafter, the "Letter of Credit") to secure performance of all its obligations under this Administrative Consent Order and under the TCDD Consent Order. The Letter of Credit shall be issued by a New Jersey bank or financial insitution or by such other bank or financial institution as shall be approved by the Department. Subject to the provisions of paragraphs 32 and 33 of this Administrative Consent Order, Givaudan shall maintain the Letter of Credit continuously in full force and effect until the requirements of this Administrative Consent Order and the TCDD Consent Order have been completed.

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30. The amount of the Letter of Credit has been determined by estimating the cost of implementing the requirements of this Administrative Consent Order and the requirements of the TCDD Consent Order.

31. The Letter of Credit shall be conditioned that in the event the Department determines that Givaudan has failed to perform any of its obligations under this Administrative Consent Order or the TCDD Consent Order, the Department may draw on the Letter of Credit; provided, however, that before any such draw can be made, the Department shall notify Givaudan in writing of the obligation(s) with which Givaudan has failed to comply, and Givaudan shall have a reasonable time, not to exceed thirty (30) days, to perform any such obligation(s).

32. If the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the TCDD Consent Order at any time exceeds the amount of the Letter of Credit, Givaudan shall promptly cause the amount of the Letter of Credit to be increased so that the amount of the Letter of Credit is equal to the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the TCDD Consent Order.

33. If the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the TCDD Consent Order are at any time less than the amount of the Letter of Credit, Givaudan may apply to the Department for permission to reduce the amount of the Letter of Credit so that it is equal to the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the TCDD Consent Order.

34. At any time during the performance of its obligations hereunder, Givaudan may apply to the Department for approval to reduce the amount of the Letter of Credit to reflect the remaining estimated combined costs of performing its obligations under this Administrative Consent Order and the TCDD Consent Order; or to substitute other financial assurance in a form and manner acceptable to the Department.

C. Oversight Cost Reimbursement

35. Subject to the limitations and reservations of rights contained in this paragraph, Givaudan agrees to reimburse the Department for the Department's reasonable oversight costs incurred in connection with this Administrative Consent Order and the Ground Water Consent Order, by submitting to the Department, within 30 days after receipt by Givaudan of an itemized accounting of such costs, a certified check, drawn to the order of the Treasurer, State of New Jersey in the full amount of such costs. Givaudan agrees to reimburse the Department for all such oversight costs up to $100,000.00. The Department reserves its right to seek recovery from Givaudan of such oversight costs in excess of $100,000 and Givaudan reserves its right to contest its obligation to reimburse the Department for any such oversight costs in excess of $100,000.00.

IV

Force Majeure

36. If any event occurs which Givaudan believes will or may cause delay in the achievement of any deadline prescribed by this Administrative Consent Order, Givaudan shall notify the Department in writing within seven (7) days of the delay or anticipated delay, as appropriate, referencing this paragraph and describing the anticipated length of the delay, the precise cause or causes of the delay, any measures taken or to be taken to minimize the delay and the time required to take any such measures to minimize the delay. Givaudan shall adopt all necessary measures to prevent or minimize any such delay. Givaudan's failure to comply with the notice requirements of this paragraph shall render this force majeure provision void as to the particular incident involved.

37. If the Department finds that any delay or anticipated delay has been or will be caused by fire, flood, riot, strike or other circumstances reasonably beyond the control of Givaudan, the Department shall extend the time for performance hereunder for a period no longer than the delay resulting from such circumstances. If, however, the event causing the delay is found by the Department not to be beyond the control of Givaudan, failure to comply with the provisions of this Administrative Consent Order shall not be excused as provided herein and shall constitute a breach of the requirements of this Administrative Consent Order. The burden of proving that any delay is caused by circumstances beyond the control of Givaudan and the length of any such delay attributable to those circumstances shall rest with Givaudan. Increases in the cost or expenses incurred by Givaudan in fulfilling the requirements of this Administrative Consent Order shall not be a basis for an extension of time. A delay by Givaudan in completing an interim requirement of this Administrative Consent Order shall not automatically extend the time for performance by Givaudan of the remaining requirements of this Administrative Consent Order. If the performance by Givaudan of its obligations under the TCDD Consent Order interferes with the performance by Givaudan of its obligations under this Administrative Consent Order, that interference shall be considered to be an event of force majeure and the provisions of this paragraph shall be applicable.

V

Reservation of Rights

38. This Administrative Consent Order shall be fully enforceable in the New Jersey Superior Court upon the filing of a summary action for compliance pursuant to N.J.S.A. 13:1D-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq.

39. This Administrative Consent Order may be enforced in the same manner as an Administrative Order issued by the Department pursuant to these same statutory authorities.

40. Nothing in this Administrative Consent Order shall constitute a waiver of any statutory right of the Department pertaining to any of the laws of the State of New Jersey, should the Department determine that additional remedial actions are necessary to protect the public health or the environment.

41. In consenting to this Administrative Consent Order and/or by complying with its provisions and requirements, whether directly or through an agent or contractor, Givaudan neither admits nor denies the Findings made herein and admits no liability or responsibility to the Department or to any other party, entity or person. This Administrative Consent Order shall not constitute or be used as evidence of any admission of law or fact against Givaudan.

VI

General Provisions

42. The provisions of this Administrative Consent Order shall be binding on Givaudan, its principals, agents, employees, successors, assigns, tenants and any trustee in bankruptcy or receiver appointed pursuant to a proceeding in law or equity.

43. No obligations imposed by this Administrative Consent Order (with the exception of paragraph 35) are intended to constitute a debt, claim, penalty or other civil action which should be limited or discharged in a bankruptcy proceeding. All obligations imposed by this Administrative Consent Order shall constitute continuing regulatory obligations imposed pursuant to the police powers of the State of New Jersey, intended to protect the public health and the environment.

44. Compliance with the terms of this Administrative Consent Order shall not excuse Givaudan from compliance with all applicable federal and state permits, statutes and regulations while carrying out the obligations imposed by this Administrative Consent Order.

45. Givaudan shall make available to the Department all data and information, including raw sampling and monitoring data, generated pursuant to this Administrative Consent Order.

46. Givaudan shall not construe any informal advice, guidance, suggestions, or comments by the Department, or by persons acting on behalf of the Department, as relieving Givaudan of its obligation to obtain written approvals as may be required herein, unless such advice, guidance, suggestions, or comments by the Department shall be submitted in writing to Givaudan pursuant to paragraph 21.

47. No modification or waiver of this Administrative Consent Order shall be valid except by written amendment to this Administrative Consent Order duly executed by Givaudan and the Department.

48. When this Administrative Consent Order becomes effective, Givaudan waives its right to a hearing on the matters contained herein, pursuant to N.J.S.A. 52:14B-1 _et seq_. and N.J.S.A. 58:10A-1 _et seq_.

49. The requirements of this Administrative Consent Order shall be deemed satisfied upon the receipt by Givaudan of written notice from the Department that Givaudan has demonstrated, to the satisfaction of the Department, that all the terms of this Administrative Consent Order have been completed.

50. This Administrative Consent Order shall take effect upon the signature of both parties.

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

3/5/87
DATE

Richard T. Dewling
Commissioner

Witness:

Michael J. Catania

GIVAUDAN CORPORATION

3/5/87
DATE GFS

By

Witness:

NAME H A Brandman

TITLE V.P. - Operations

NAME

TITLE SR. VICE PRESIDENT

Approved as to Form
Date 2/25/87

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APPENDIX A

SCOPE OF WORK

REMEDIAL INVESTIGATION

AND

FEASIBILITY STUDY

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I. REMEDIAL INVESTIGATION

A. Objectives

1. determine the nature and horizontal and vertical extent of soil, surface water and ground water contamination at and/or emanating from the Site.

2. determine migration paths of contaminants through soil, ground water, surface water, sediment and local potable wells to determine type, extent and physical states of contamination

3. determine impact of the contamination on human health and the environment

4. collect, present and discuss all data necessary to adequately support the development of the feasibility study and the selection of a remedial action alternative that will adequately mitigate the adverse impacts of the contamination on human health and the environment

B. Contents of Remdial Investigation Work Plan

1. a detailed schedule for all remedial investigation activities set fort in this Administrative Consent Order and in this Scope of Work, and a detailed description of how Givaudan will accomplish these tasks.

2. a Site history, including disposal practices and location of all known contaminant sources

3. a health and safety plan, for on-site personnel to minimize their personal injury, illness and potential environmental impairment associated with the site investigation, including:

   - listing of personnel protective equipment (including respiratory protection) and guidelines for their use, including manufacturer, model, duration of safety period, and any required certification documentation

   - listing of safety equipment (including manufacturer, expiration date and model) to be used, such as: fire extinguishers, portable eye wash stations, air monitoring equipment, gamma survey instrument, etc. (equipment shall meet OSHA standards or other acceptable industrial standards)

   - contingency plans for emergency procedures, spill prevention/response, and evacuation plans

   - on-site monitoring for personnel safety (OVA, HNU)

   - criteria for selecting proper level of protection

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4. a field sampling plan

   a. specify number and type of samples required to accurately determine the nature and horizontal and vertical extant of soil, surface water and ground water contamination at on and/or emanating from the Site

   b. locate sampling points on a map of the Site

   c. explain the type of data which will be collected and intentions for use of data

   d. specify location (on site map) and depths of proposed soil borings, piezometers, monitoring wells and other sampling points

   e. specify soil, sediment, surface water and ground water analyses including test parameters

   f. document all field sampling collection and analyses with appropriate chain-of-custody procedures

5. a quality assurance/quality control plan

   a. in order to ascertain the reliability of monitoring data for both laboratory and field investigations

   b. include all appropriate information in "Interim Guidelines and Specifications for Preparing Quality Assurance Project Management Plan" (USEPA), "Quality Assurance Project Management Plan" (NJDEP) and Appendix C which is attached hereto and incorporated herein

6. a equipment decontamination plan

   a. drilling equipment, paying particular attention to down hole tools, back of drilling rig and drilling rods

   b. sampling equipment

   c. personnel

C. Site Investigation

1. Soil

   a. obtain drilling permits pursuant to N.J.S.A. 58:4A

   b. install soil borings under direct supervision of a New Jersey licensed well driller and a qualified geologist

ıir soil boring and sampling equipment between
samples and borings according to approved
ıination plan

soil according to a standard approved system, e.g.,
er, Unified

particle size in laboratory on representative samples
rm field identification

soil samples to determine presence of contaminants in
ording to approved sampling plan

qualified hydrogeologist with substantial experience
nd water pollution investigations oversee all site
es

well permits pursuant to N.J.S.A. 58:4A-14 and
7:8-3.11

l wells under the direct supervision of a New Jersey
well driller and a qualified hydrogeologist (see
el

s in accordance with monitor well specifications
dix B

static water level monthly

ly constructed monitor wells can
a contamination problem. Therefore, particular
n shall be given to the details of these specifica-
The Department has the authority to shut down a
operation which is not adhering to the approved
es. Data derived from improperly constructed wells
t be accepted by the Department.

split spoon samples, during drilling through overbur-
ording to ASTM Standard Penetration Methods, ASTM D1
either continuously or at five-foot intervals, at
in soil strata, and at all zones which show obvious
contamination

all soil samples for future reference and/or analysis

all well casings to the nearest hundreth (0.01) foot
an sea level

drilling equipment between wells according to
decontamination plan

n or adjacent to the

npling to determine:

e water and sediment

by surface runoff,

er discharge

raction at the Site.

sampling plan (see

uction diagrams for

sured to the nearest

urs

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b. sample locations

- monitor well locations and elevations
- sample collection locations
- soil boring locations

c. ground water contours

d. contaminant plume(s)

3. discussion of data

a. direction and rate of ground water flow in the aquifer(s), both horizontally and vertically

b. levels of surface water and ground water contamination as compared to surface water and ground water quality standards, where pertinent, or background levels (for the purpose of this discussion, "background levels" are defined as representative results of ground water analyses up gradient of the site or beyond a hydrologic boundary)

c. nature and extent of ground water contamination in the aquifer(s), both horizontally and vertically

d. contaminant behavior, stability, biological and chemical degradation, mobility

e. projected rate of contamination movement

f. identification of contamination sources

4. recommendations for additional investigations

5. assessment of impact of contamination on human health and the environment

NOTE 2: The Department may require additional investigation activities based on its review of remedial investigation report

II. FEASIBILITY STUDY

A. Objectives

1. identify and evaluate all potentially viable remedial action alternatives for the contamination at and/or emanating from the Site

2. recommend the remedial action alternative best suited to:

a. achieve and maintain applicable surface water and ground water quality standards; and

b. return the site to background conditions

B. Identification of Remedial Alternatives

1. develop alternatives to incorporate remedial technologies, response objectives and criteria, and other appropriate considerations into a comprehensive, site-specific approach

2. consider all appropriate remedial alternatives

3. screen all potentially viable remedial action alternatives to narrow the list of potential alternatives for further detailed analysis, according to the following:

   a. environmental and public health impacts

   b. engineering feasibility and reliability

   c. cost, including operation and maintenance costs

4. evaluate the limited number of alternatives that remain after the initial screening according to the following:

   a. describe appropriate treatment and disposal technologies, as well as any permanent facilities required

   b. specify engineering considerations required to implement the alternative (e.g., treatability study, pilot treatment facility, additional studies needed to proceed with final remedial design)

   c. describe environmental and public health impacts and propose methods for mitigating any adverse effects

   d. operation and maintenance/monitoring requirements of the completed remedy

   e. off-site disposal needs and transportation plans

   f. temporary storage requirements

   g. requirements for health and safety plans during remedial implementation (including both on-site and off-site health and safety considerations)

   h. describe how the alternative could be phased into individual operable units including how various components of the remedy could be implemented individually, or in groups resulting in a functional phase of the overall remedy

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i. describe how the alternative could be segmented into areas to allow implementation of differing phases of the alternative

j. a review, provided by the Department of any off-site storage, treatment or disposal facility to ensure compliance with applicable hazardous waste regulatory requirements

k. describe which federal, state and local permits would be necessary for each alternative identified and the information necessary for the development of each of the permits

l. time required for implementation, including interim dates of significance

C. Evaluation of Alternatives

1. evaluate and present the alternative remedies identified in Part B above and recommend the most environmentally sound alternative(s)

a. develop a health and environmental assessment

i. evaluate each alternative considering environmental fate, exposure and associated health and environmental effects

ii. analyze mitigating adverse effects, and physical or legal constraints

b. develop a cost evaluation for each remedial action alternative, and for each phase or segment of the alternative

i. present the cost as a present-worth cost

ii. include total cost of implementing the alternative including the annual operation and maintenance costs of the alternative for the full duration of the alternative

c. evaluate each alternative in accordance with the criteria established in Part A above

i. apply the evaluation criteria uniformly to each alternative

ii. identify a number of remedial alternatives that are comparable

iii. identify the most appropriate alternative, given the specific constraints of the project

iv. prepare a trade-off matrix that enables identification of now comparable techniques including

- level of cleanup achievable
- time to achieve cleanup
- feasibility
- implementability
- reliability
- ability to minimize adverse impacts during action
- ability to minimize off-site impacts caused by action
- remoteness of activities
- useability of ground water
- useability of surface water
- useability of site

d. recommend the alternative that is the most environmentally sound resulting from Sections II. C.1.b. and C.1.c.

i. prepare rationale for recommending the selected alternative stating the advantages over other alternatives considered

ii. a conceptual design of the recommended alternative should be included, providing, as a minimum, the following information:

- the selected engineering approach with implementation schedule
- any special implementation requirements
- applicable design criteria
- preliminary site layouts
- budget cost estimates including
- operation and maintenance requirements
- safety plan, including costs

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APPENDIX B

Monitor Well

Installation Specifications

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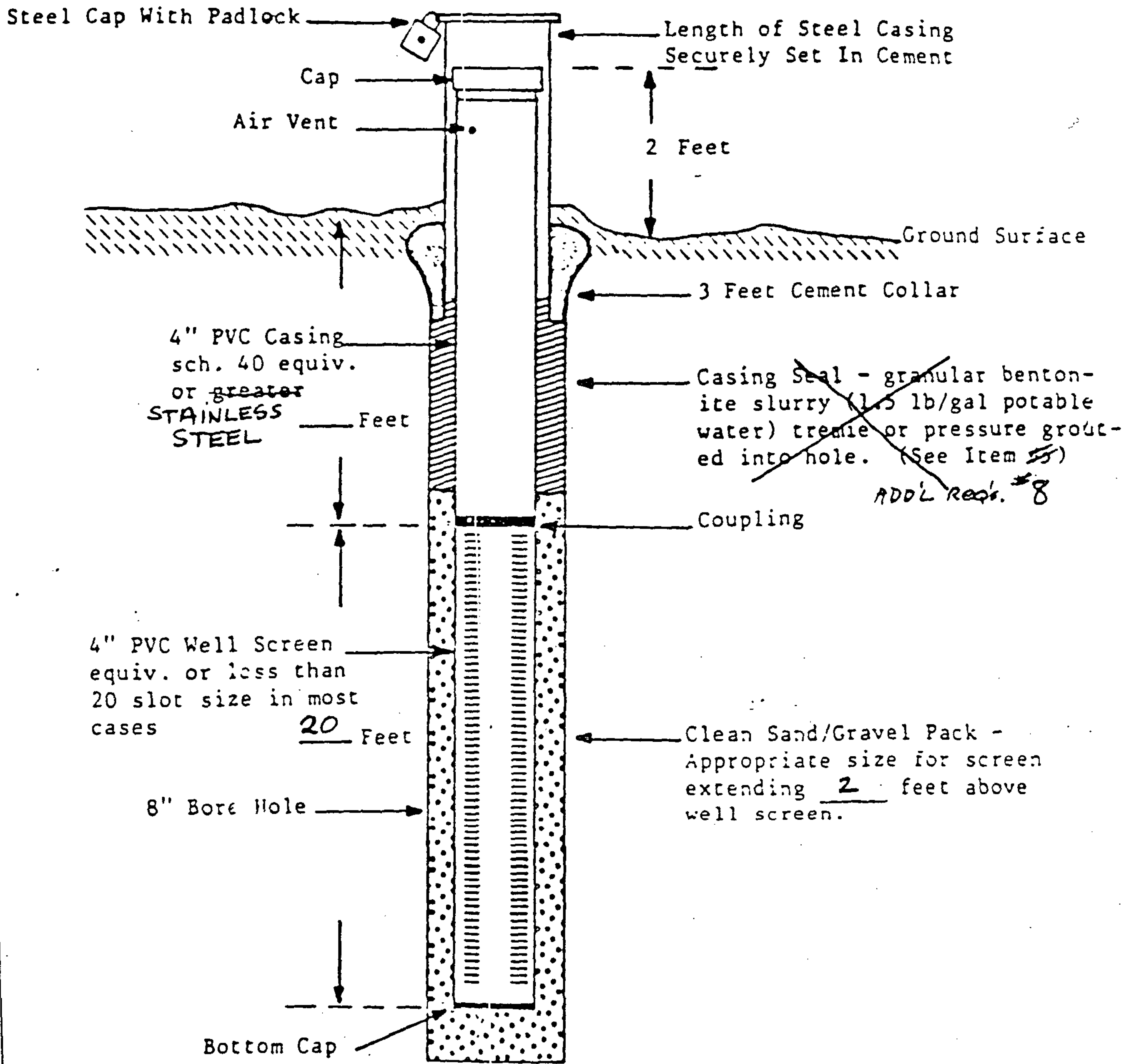
New Jersey De, .rtment of Environm_ntal Protection
Unconsolidated Monitor Well Specifications*

Site Name: GIVAUDAN CORP.

Location: CLIFTON

Date: 2 APR 85



NOT TO SCALE

EQU EMENTS:

. ification to the NJDEP is required two (2) weeks prior to drilling.
. ate well permits are required for each monitor well constructed by the driller. Report "use of well" on well permit application. Permit number must be permanently affixed to each monitor well. NOTE: Well driller must be licensed in the State of New Jersey.

OVER PLEASE

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3. The borehole must be a minimum of four (4) inches greater than the casing diameter.
4. Wells must be gravel packed unless noted otherwise in Additional Requirement #8.
5. Approved high grade sodium base, well sealant type, granular bentonite must be used to seal casing. Casing sealant and drilling fluids must be mixed with potable water.
6. All wells must be developed upon completion for a minimum of one (1) hour or to yield a turbid-free discharge.
7. The driller must maintain an accurate written log of all materials encountered in each hole, record all construction details for each well, the static water levels, and any tidal fluctuations (when applicable). This information must be submitted to the Office of Water Allocation as required by N.J.S.A. 58:4A.
8. If low level organic compounds are to be sampled for, only threaded or press joints (no glue joints) are acceptable for PVC.
9. A length of steel casing with a locking cap must be securely set in cement a minimum of three (3) feet below ground surface.
10. Top of casing (excluding cap) must be surveyed to the nearest hundreth foot (0.01) by a licensed surveyor. The casing must be permanently marked at the point surveyed. The well(s) should be numbered clearly on the casing. A detailed site map with the well locations and casing elevations must be submitted to HARVEY McKENZIE, NJGS.

11. NOTICE IS HEREBY GIVEN OF THE FOLLOWING:

a. Review by the Department of well locations and depths is limited solely to review for compliance with the law and Department rules;
b. The Department does not review well locations or depths to ascertain the presence of, nor the potential for, damage to any pipeline, cable or other structure;
c. The permittee (applicant) is solely responsible for safety and adequacy of the design and construction of wells required to be constructed by the Department;
d. The permittee (applicant) is solely responsible for any harm or damage to person or property which results from the construction or maintenance of any well; this provision is not intended to relieve third parties of any liabilities or responsibilities which are legally theirs.

ADDITIONAL REQUIREMENTS (IF CHECKED):

1. Top of screen set 5 feet above/below water table.
2. Split Spoon Samples CONTINUOUSLY OR AT 5' INTERVALS, Δ's IN LITHOLOGY, OBVIOUS CONTAMINATION.
3. Dedicated Bailer (Sampler) ~~In Well(s)~~ LAB CLEANED.
4. Threaded or Press Joints ______
5. Five (5) Foot Casing Tailpiece Below Screen ______
6. Centralizers On Screen ______
7. Borehole Geophysical Log(s) ______
8. Other CEMENT / BENTONITE GROUT, NO REVERT, NO QUICK-GEL

* OTHER MATERIALS, DESIGNS AND CASING DIAMETERS MAY BE USED WITH PRIOR APPROVAL BY THE NJDEP.

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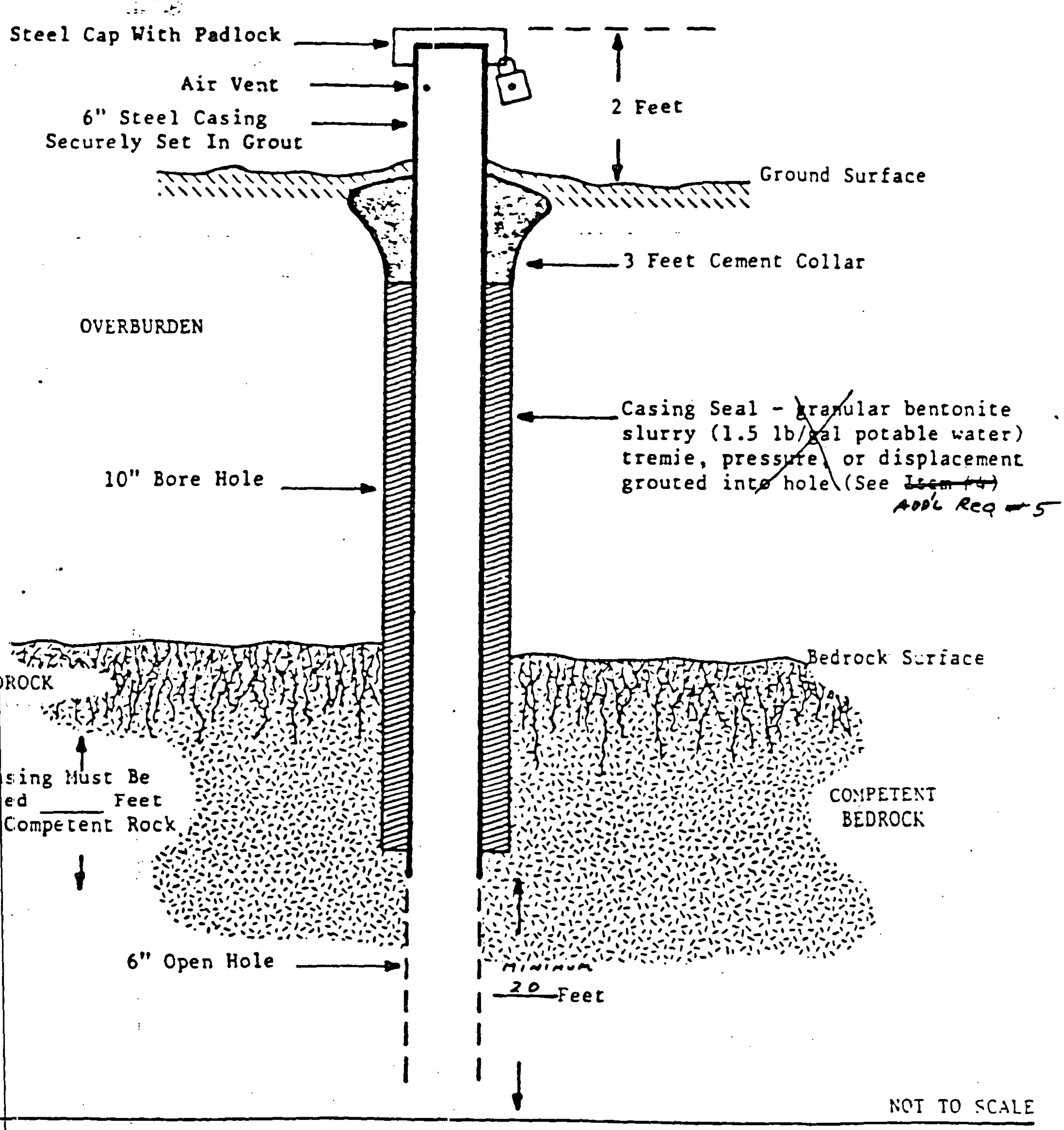
New Jersey Department of Environmental Protection

Rock Monitor Well Specifications*

te Name: GIVAUDAN CORP.

Location: CLIFTON

Date: 2 APR 85



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Notification to the NJDEP is required two (2) weeks prior to drilling.
State well permits are required for each monitor well constructed by the driller.
Report "use of well" on well permit application. Permit number must be permanently affixed to each monitor well. NOTE: Well driller must be licensed in the State of New Jersey.

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3. Oversize borehole, minimum four (4) inches greater than casing diameter drilled through overburden with casing sealed ten (10) feet into competent rock unless shown otherwise above.
4. Approved high grade, sodium base, well-sealant type, granular bentonite must be used to seal casing. Casing sealant and drilling fluids must be mixed with potable water.
5. Well must be developed upon completion for a minimum of one (1) hour or to yield a turbid-free discharge.
6. The driller must maintain an accurate written log of all materials encountered in each hole, record all construction details for each well, and record the depth of major water bearing fracture zones. This information must be submitted to the Office of Water Allocation as required by N.J.S.A. 58:4A.
7. Cement collar must be installed a minimum of one (1) hour after casing seal has been emplaced.
8. Locking caps must be provided to secure each well.
9. Top of each well casing (excluding cap) must be surveyed to the nearest hundredth foot (0.01) by a licensed surveyor. The casing must be permanently marked at the point surveyed. The well should be numbered clearly on the casing. A detailed site map with well locations and casing elevations must be submitted to HARVEY McKENZIE, NJGS.

10. NOTICE IS HEREBY GIVEN OF THE FOLLOWING:

a. Review by the Department of well locations and depths is limited solely to review for compliance with the law and Department rules;
b. The Department does not review well locations or depths to ascertain the presence of, nor the potential for, damage to any pipeline, cable or other structures;
c. The permittee (applicant) is solely responsible for safety and adequacy of the design and construction of well required to be constructed by the Department;
d. The permittee (applicant) is solely responsible for any harm or damage to person or property which results from the construction or maintenance of any well; this provision is not intended to relieve third parties of any liabilities or responsibilities which are legally theirs.

ADDITIONAL REQUIREMENTS (IF CHECKED):

☒ 1. Split Spoon Samples (In Overburden) 5' INTERVALS, Δ's IN LITHOLOGY, OBVIOUS CONTAMINATION

☐ 2. Rock Core Samples

☒ 3. Dedicated Bailer (Sampler) ~~In Well(s)~~ LAB CLEANED

☐ 4. Borehole Geophysical Log(s)

☒ 5. Other CEMENT/BENTONITE GROUT, NO REVERT, NO QUICK-GEL

* OTHER DRILLING METHODS, MATERIALS, DESIGNS AND CASING DIAMETERS MAY BE USED WITH PRIOR APPROVAL BY NJDEP.

Rev. 9/83

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APPENDIX C

Quality Assurance

and

Quality Control

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QUALITY ASSURANCE DELIVERABLE REQUIREMENTS

There are three parts to this Appendix. The first part outlines, according to sample/data type, frequency and use, the approximate percentage of samples for which the Tier I and Tier II quality assurance deliverables are required. The second part is a copy of the Tier I Quality Assurance Deliverable Requirements. The third part is a copy of the Tier II Quality Assurance Deliverable Requirements.

CRITERIA FOR QUALITY ASSURANCE DELIVERABLE REQUIREMENTS

	TIER I	TIER II
A. Remedial Investigation:		
1. initial RI phase	100%	
2. subsequent RI phases	10%, or minimum of one monitor well, or one sample per sampling event	90%
B. Remedial Action:		
1. monitoring of decontamination effectiveness		
a. initial sampling	100%	
b. subsequent sampling	25%	75%
2. sampling to support proposal to terminate decontamination system	100%	
3. post cleanup/removal soil sampling to determine if any additional cleanup/removal is required	100%	
C. Other Site Specific Considerations:		
1. potable water		
a. initial sampling	100%	
b. subsequent sampling	25%	75%

[Include copy of Tier I and Tier II Quality Assurance Deliverable Requirements documents after this page]

New Jersey Department of Environmental Protection

Division of Waste Management

Tier I Quality Assurance and

Generalized Reporting Format Deliverable Requirements

GENERALIZED REPORTING FORMAT PACKAGE

The elements of data reporting required in the Final Data Report must be reported and delivered to NJDEP-DWM for each environmental and waste sample submitted. It is understood data reporting format for particular laboratories may vary due to problems with software compatibility. The document that follows is a generalized data reporting format that includes each item required. The submitting laboratory may alter the reporting format to make it compatible with their computer systems; however, the substantive data required to meet the intent of this package shall not change. Three copies of the Final Data Report must be submitted. The data may be used by NJDEP in civil and/or criminal litigation, therefore the strictest adherence to chain of custody protocol, document control, and quality assuranced procedures is required. The Submitting laboratory must obtain approval of their specific reporting format from NJDEP prior to initiation of measurements. The contract laboratory is required to furnish NJDEP-DWM and the prime contractor a weekly progress report on sample status. The laboratory must adhere to a 40 day turnaround time from date of sample receipt.

All reference to a specific IFB document shall be that specific document or a more recent officially issued revision. Earlier editions of the specific IFB stated within this document shall not be used.

The hierarchy of deliverable requirements to which a laboratory will be held is:

1. Specific contractual agreements and Generalized Reporting Package.

2. Official analytical methodology.

3. Laboratory SOP.

OCTOBER, 1988

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TABLE OF CONTENTS

I. GENERAL GUIDELINES FOR DELIVERABLES

II. REPORTING REQUIREMENTS AND DELIVERABLES FOR ORGANICS:
VOLATILES, ACID AND BASE/NEUTRAL EXTRACTABLES

III. REPORTING REQUIREMENTS AND DELIVERABLES FOR ORGANICS:
PESTICIDES AND PCB's

IV. REPORTING REQUIREMENTS AND DELIVERABLES:
METALS

V. REPORTING REQUIREMENTS AND DELIVERABLES:
2, 3, 7, 8 - TCDD (DIOXIN)

LIST OF FORMS

1. G-1: Title Page
2. G-2: Sample Analysis Request Form
3. G-3: Chain of Custody Record
4. G-4: Chain of Custody Record
5. G-5: Laboratory Chronicle
6. G-6: Methodology Summary
7. O-1: Targeted Analyte - Summary of Quantitative Results
8. O-2: Water Matrix Spike/Matrix Spike Duplicate Recovery
9. O-3: Soil Matrix Spike/Matrix Spike Duplicate Recovery
10. O-4: GC/MS Tune Summary: Volatile Organics
11. O-5: GC/MS Tune Summary: Extractable Organics
12. O-6: Initial Calibration Data: Volatile Organics
13. O-7: Initial Calibration Data: Extractable Organics
14. O-8: Continuing Calibration Check: Volatile Organics
15. O-9: Continuing Calibration Check: Extractable Organics
16. O-10: GC/MS Surrogate Recovery Data
17. O-11 through O-13: Non-Targeted Analyte Summary
18. P-1: Pesticide/PCB Standard Summary
19. P-2: Pesticide/PCB Identification
20. M-1: Analytical Results and Quality Assurance Data: Metals
21. M-2: Initial and Continuing Calibration Verification: Metals
22. M-3: ICP Interference Check Sample Summary
23. M-4: Method of Standard Addition Results

24. D-1: 2, 3, 7, 8 - TCDD Data Report Form

25. D-2: 2, 3, 7, 8 - TCDD Partial Scan Conformation

26. D-3: 2, 3, 7, 8 - TCDD Initial Calibration Summary

27. D-4: 2, 3, 7, 8 - TCDD Continuing Calibration Summary

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Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RICHARD T. DEWLING, Ph.D., P.E.
COMMISSIONER
CN 402
TRENTON, N.J. 08625
609-292-2885

IN THE MATTER OF GIVAUDAN CORPORATION : ADMINISTRATIVE CONSENT ORDER TCDD

The following FINDINGS are made and ORDER is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter the "Department") by Executive Order No. 40B (1983), signed by Governor Thomas H. Kean on June 17, 1983, N.J.S.A. App. A:9-45, N.J.S.A. 13:1D-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq.

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FINDINGS

1. Givaudan Corporation (hereinafter "Givaudan") owns and operates an office, manufacturing, packaging, storage, shipment and research complex on 31.43 acres on Delawanna Avenue, Clifton, New Jersey (hereinafter "the Givaudan Plant") which currently has approximately 685 employees and has been assessed by Clifton for 1984 real estate tax purposes at $9,597,700. The Givaudan Plant includes a chemical manufacturing facility located to the south of Delawanna Avenue, at 125 Delawanna Avenue (Block 73-3, Lot 2) (hereinafter "the Site").

2. Givaudan manufactures a variety of aromatic chemicals at the Site and, until on or about April, 1984, manufactured hexachlorophene, an antibacterial agent used in hospitals, at the Site using, as a raw material, 2,4,5-Trichlorophenol (hereinafter "TCP") which was pre-purified. During 1947 and 1948, Givaudan also manufactured TCP at the Site.

3. On June 3, 1983, Givaudan agreed, at the request of the Department, to conduct a sampling program designed to ascertain the presence or absence of 2,3,7,8-Tetrachlorodibenzo- p-dioxin (hereinafter "TCDD") in or on the soils, waters, equipment and/or structures at the Site.

4. Between June 12 and 17, 1983 Givaudan conducted the sampling program described in paragraph 3, under the supervision of the Department.

5. On June 17, 1983, when the results of analyses of the 22 samples taken during the sampling program described in paragraph 3 became known to Givaudan, Givaudan reported to the Department that the analyses of 15 out of 22 samples taken indicated the presence of TCDD in detectable concentrations. Of

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those 15 samples, 6 showed concentrations of less than 1 ppb, 8 showed concentrations of between 1 ppb and 7 ppb, and one showed a TCDD concentration in excess of 7 ppb. All samples whose analysis indicated the presence of TCDD in concentrations over 1.0 ppb were taken in the area of the Site where hexachlorophene had been manufactured (hereinafter, the "Contaminated Process Area").

6. On June 17, 1983, the Governor issued Executive Order No. 40B, extending the coverage of Executive Order No. 40 to the Site, and the Department issued Administrative Order No. EO 40B-1 (hereinafter, "the Administrative Order"), which directed, among other things, (a) that the area where TCDD contamination in concentrations equal to or in excess of 1.0 ppb had been found to be secured and covered with a tarpaulin, (b) that hexachlorophene manufacturing temporarily cease, (c) that there be no movement of waste materials or hexachlorophene from the Site without the permission of the Department, (d) that additional samples be taken on and off the Site to determine the presence or absence of TCDD contamination, (e) that demolition and construction operations on the Site temporarily cease and (f) that Givaudan supply the Commissioner of Health with certain information so that an appropriate health screening of Givaudan's employees could be conducted.

7. On June 18, 1983, a Field Investigation Team of the United States Environmental Protection Agency (hereinafter "EPA") conducted a sampling program in the area surrounding the Site. No TCDD was detected in any of the samples taken during this sampling program.

8. On June 18 and 25, 1983, Givaudan, under the supervision of the Department, conducted TCDD sampling at the Site. Of the 41 samples taken, 25 showed TCDD contamination in detectable concentrations. Of those 25 samples, 13 showed TCDD concentrations of less than 1 ppb, 11 showed TCDD concentrations of between 1 ppb and 7 ppb, and only 1 sample had TCDD present in excess of 7 ppb.

9. On July 9, 1983, Givaudan, under the supervision of the Department, conducted a TCDD sampling program including sweep and wipe sampling of the interiors of buildings on portions of the Site where hexachlorophene or TCP were being or had been manufactured. Of the 31 samples analyzed, TCDD was present in detectable concentrations in 20 samples. Of those 20 samples, 9 chip samples showed TCDD concentrations of less than 1 ppb, 4 showed TCDD concentrations of between 1 ppb and 7 ppb, one chip sample had TCDD present in excess of 7 ppb (in Building 54 where TCP is believed to have been manufactured over 35 years ago), and 6 wipe samples showed TCDD concentrations of between 1 and 7 nanograms per square foot.

10. Between July 1 and September 30, 1983, the Department of Health conducted health screenings of Givaudan's employees and found no indications of adverse health effects from any exposure those employees might have had to TCDD contamination.

11. On July 26, 1983, Givaudan provided the Department with detailed information regarding (a) the history of chemical production processes at the Site, including the production of TCP and hexachlorophene, (b) the history of operations at the Site, including by predecessor owners or operators, (c) a summary of the solid and hazardous waste and waste water disposal practices and

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facilities of Givaudan, (d) the identification of all suppliers of TCP ever used or stored at the Site, (e) a summary of analytical tests performed to determine the presence or absence of TCDD contamination in TCP produced at the facility or purchased from other sources, (f) a summary of analytical testing for TCDD contamination in hexachlorophene produced by Givaudan, and (g) a summary of demolition activities which had occurred at the Site, including a description of activities formerly conducted in demolished buildings and related information.

12. On August 5, 1983, the Department requested Givaudan to submit an occupational hygiene plan to the Department of Health to prevent or minimize TCDD emissions from the hexachlorophene process buildings and on August 15, 1983, Givaudan submitted such a plan to the Department of Health.

13. On August 11, 1983, Givaudan, under the supervision of the Department, resampled Buildings 58, 59 and 60 for TCDD contamination. All samples analyzed had less than 1 ppb of TCDD.

14. On August 18, 1983, Givaudan was authorized by the Department to resume hexachlorophene production under certain conditions and Givaudan resumed hexachlorophene production in accordance with those conditions.

15. On September 8, 1983, EPA conducted additional off-site perimeter sampling for TCDD contamination. No TCDD contamination was detected.

16. On September 12, 1983, Givaudan, with the approval of the Department, conducted (a) a biased, systematic sampling program in the area of the Site around the storm water lagoon, and (b) a random sampling program around the remainder of the Site. The purpose of the random sampling program was to divide the areas of the Site other than the Contaminated Process Area into non-process areas which were to be considered contaminated by TCDD (hereinafter the "Contaminated Non-Process Area") and process and non-process areas which were to be considered not contaminated by TCDD (hereinafter the "Non-Contaminated Area").

17. On September 19, October 17 and December 1, 1983, Givaudan, under the supervision of the Department, conducted a resampling program for TCDD contamination in Buildings 58, 59 and 60. All samples analyzed had less than 1 ppb of TCDD.

18. On March 16, 1984, Givaudan submitted to the Department a proposed "TCDD Remedial Action Plan", prepared by Environmental Resources Management, Inc. (hereinafter "ERM") detailing measures Givaudan proposed to take to prevent human and environmental exposure to on-Site soils contaminated with TCDD in the Contaminated Process Area and the Contaminated Non-Process Area.

19. On April 16, 1984, Givaudan and the Department met to discuss Givaudans's "TCDD Remedial Action Plan" and Givaudan requested relief from the Administrative Order so that construction could begin on a modern, environmentally sound chemical process sewer system at the Site. On May 1, 1984, the Department submitted written comments to Givaudan on its proposed "TCDD Remedial Action Plan".

20. On May 1, 1984, the Department approved Givaudan's recommendation of a phased approach to conducting an investigation of the Site for TCDD contamination in which Phase I would address the Contaminated Process Area and Phase II would address the Contaminated Non-Process Area.

21. On May 31, 1984, Givaudan submitted to the Department a revised "Site Investigation Plan" in response to the Department's comments on Givaudan's "TCDD Remedial Action Plan". Included in Givaudan's "Site Investigation Plan" was a detailed plan for the taking of samples to determine the presence or absence of TCDD along the route of the planned chemical process sewer, located entirely outside the Contaminated Process and Contaminated Non-Process Areas.

22. On or about June 29, 1984, the Department approved those portions of the "Site Investigation Plan" which contained a plan for sampling to determine the presence or absence of TCDD (a) along the route of the planned chemical process sewer, all of which was outside the Contaminated Process and Contaminated Non-Process Areas, and (b) in the Contaminated Process and Contaminated Non-Process Areas.

23. Between July 17 and 30, 1984, the sampling program described in the preceding paragraph was executed under the supervision of the Department. At the request of the Department, split samples were taken and analyzed, at Givaudan's expense, at a separate, Department-approved laboratory to assure the accuracy of the sampling results. No TCDD contamination was detected in the samples taken along the route of the planned chemical process sewer. Of the 41 samples taken in the Contaminated Process Area, all but 1 sample had less than 1 ppb of TCDD contamination. The remaining sample had less than 6 ppb of TCDD contamination. Of the 83 samples taken in the Contaminated Non-Process Area, all but 10 had less than 7 ppb of TCDD contamination. At the request of the Department, Givaudan took 3 additional samples at the site of a filled-in former trench which was visible in an aerial photograph taken in 1950. No TCDD contamination was detected.

24. On August 17, 1984, the Department granted Givaudan permission, subject to certain conditions, to construct the new planned chemical process sewer.

25. On September 24, 1984, Givaudan requested that the Department grant relief from the Administrative Order so that Givaudan could initiate certain specific construction activities outside the Contaminated Process and Contaminated Non-Process Areas, including (a) removal of a number of storage tanks, (b) construction of a 14-foot diameter concrete pad, and (c) construction of a gravel roadway. On December 5, 1984, the Department granted permission to Givaudan to proceed with removal of the storage tanks and construction of the 14-foot diameter concrete pad, but required Givaudan to conduct additional sampling along the route of the proposed roadway before commencing construction.

26. On December 13, 1984, Givaudan requested relief from the Department from the Administrative Order so that certain curbing could be removed and the entrance to the Site from Delawanna Avenue could be enlarged and a security fence constructed at the entrance. On January 16, 1985, the Department granted Givaudan permission to proceed with the construction at the entrance to the Site.

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27. On February 8, 1985, Givaudan requested relief from the Department from the Administrative Order so that additional construction projects outside the Contaminated Process and Contaminated Non-Process Areas could be commenced, including (a) demolition of two buildings located at the north end of the Site, and (b) construction of footings for a series of overhead pipe supports designed to service the renovated Site.

28. On May 17, 1985, the Department granted Givaudan permission for the construction of footings for a series of overhead pipe supports designed to service the renovated Site and approved Givaudan's proposed sampling plan to determine the presence or absence of TCDD contamination in buildings throughout the Non-Contaminated Area. The Department agreed that the Site is released from the restrictions of the Administrative Order with the exceptions of (a) the Contaminated Process Area and the Contaminated Non-Process Area, and (b) buildings located in the Non-Contaminated Area, which will be released from the restrictions of the Administrative Order upon successful completion of the sampling program and the finding that there has been no migration of TCDD contamination outside the Contaminated Process and Non-Process Areas.

29. On June 15, 1985, Givaudan, with the approval and under the supervision of the Department, conducted a chip sampling program at and around Building Nos. 44, 46/47, 51, 68, 68A and the Power Station Wall at the Site to determine whether there had been any migration of TCDD outside the defined boundaries of the Contaminated Process and Non-Process Areas.

30. During the course of the TCDD sampling program conducted by Givaudan and EPA through July 30, 1985, a total of 402 samples were analyzed for TCDD contamination. All samples analyzed as having TCDD contamination in concentrations of 1 ppb or more were located in the Contaminated Process or Contaminated Non-Process Areas. 26 samples were taken and analyzed by EPA in the area surrounding the Site, all of which were analyzed as containing no TCDD contamination in concentrations of 1 ppb or more. 329 samples were taken and analyzed by Givaudan outside the buildings located on the Site, 255 of which were analyzed as containing no TCDD contamination in concentrations of 1 ppb or more, 51 of which were analyzed as having TCDD contamination in concentrations between 1 ppb and 7 ppb, and 23 of which were analyzed as having TCDD contamination in excess of 7 ppb. 47 samples were taken and analyzed at various locations inside the buildings located on the Site, 6 of which were analyzed as having TCDD contamination in concentrations of 1 nanogram per square foot or more (none of which were analyzed as having TCDD contamination in concentrations in excess of 7 nanograms per square foot) and 41 of which were analyzed as having no TCDD contamination in concentrations of 1 nanogram per square foot or less.

31. Pursuant to New Jersey Pollutant Discharge Elimination System Permit No. NJ-0099414, effective October 1, 1982, Givaudan has discharged industrial waste water into the facilities of the Passaic Valley Sewerage Authority and has analyzed that waste water discharge for TCDD contamination on a monthly basis at a detection level at or below 1 ppb. No TCDD contamination has been detected in any of the industrial waste water discharge from the Site.

32. As a result of the investigation conducted by Givaudan under the supervision of the Department, in conjunction with EPA and the Department of Health, to determine the location and extent of TCDD contamination and the effect, if any, upon employees of Givaudan and other persons of possible exposure to that contamination, (a) the location and extent of TCDD contamination in the Contaminated Process Area has been delineated, (b) the delineation of TCDD contamination in the Contaminated Non-Process Area remains to be completed, (c) the Non-Contaminated Areas have been determined to have less than 1 ppb of TCDD contamination, (d) at this time there is no evidence that TCDD contamination has migrated off the Site, and (e) at this time there is no evidence that Givaudan employees or other persons have suffered adverse health effects from exposure to the TCDD contamination found on the Site.

33. Based on current available literature, scientists from the Center for Environmental Health of the Centers for Disease Control of the United States Public Health Service (hereinafter, "CDC") and from the United States Department of Agriculture have concluded that: (a) 1 ppb of TCDD in residential soil is a reasonable level at which to begin consideration of action to limit human exposure to contaminated soil; (b) environmental situations may vary widely, and whether a particular level of TCDD contamination in soil should give rise to concern has to be evaluated on a case-by-case basis.

34. Since the level of human exposure can be expected to be lower in non-residential areas and since other measures may be employed to restrict access and human exposure thereby controlled, the CDC and the Department have determined: (a) that soil in industrial areas contaminated with concentrations of 7 ppb or greater of TCDD should be removed and properly disposed unless removal of contaminated soil is not feasible; and (b) that when soil contaminated with concentrations of less than 7 ppb, but greater than 1 ppb, are to remain at the site, the area shall be capped, a regular monitoring program implemented, and permanent land use controls imposed.

35. Concurrently with the issuance of this Administrative Consent Order, the Department has also issued, with the consent of Givaudan, another administrative consent order, entitled "In the Matter of Givaudan Corporation - Administrative Consent Order Ground Water" (hereinafter, the "Ground Water Consent Order"), covering the investigation, delineation and remediation of ground water contamination, if any, at and/or originating from the Site.

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED AND AGREED THAT:

I.

Physical Condition of the Site

36. Givaudan shall continue to maintain all areas of the Site where analytical results have indicated the presence of TCDD contamination in concentrations of 1 ppb or more in a closed and secured condition, with physical access thereto restricted. All such areas shall be covered by a permeable ground cover

installed by a contractor approved by representatives of the Department and EPA in such manner and location as may be directed by those representatives.

37. Givaudan shall not engage in any demolition, excavation, movement or disturbance of soil, or placing, movement or removal of construction materials or construction equipment in the Contaminated Process and Non-Process Areas without prior written permission from the Department.

II

Delineation of TCDD Contamination
In the Contaminated Non-Process Area

38. Within thirty (30) days after the effective date of this Administrative Consent Order, Givaudan shall submit to the Department for its review and approval, a detailed draft TCDD field sampling plan (hereinafter, the "FSP") to complete the delineation of TCDD contamination in the Contaminated Non-Process Area.

39. Within fifteen (15) days after receipt of the Department's written comments on the draft FSP, Givaudan shall modify the draft FSP as necessary to conform to the Department's comments and shall submit the modified FSP to the Department for its approval.

40. Within ninety (90) days after receiving the Department's written approval of the modified FSP, Givaudan shall conduct and complete the work described in the modified FSP and shall submit to the Department for its review and approval, a draft TCDD investigation report (hereinafter, the "Investigation Report") detailing the results, recommendations and all analytical data, developed in implementing the FSP.

41. Within fifteen (15) days after receipt of the Department's written comments on the Investigation Report, Givaudan shall modify the Investigation Report as necessary to conform to the Department's comments and shall submit the modified Investigation Report to the Department for its approval, or shall initiate such additional investigations as may be found necessary by the Department, in accordance with a schedule to be established by the Department.

III.

Feasibility Study of TCDD Contamination in the
Contaminated Process and Contaminated Non-Process Areas

42. Within thirty (30) days after the approval by the Department of the Investigation Report, Givaudan shall submit to the Department for its review and approval, a draft work plan to conduct a feasibility study of remedial action alternatives for TCDD contamination in the Contaminated Process and Contaminated Non-Process Areas (hereinafter, the "TCDD Work Plan"), based on the scope of work set forth in Appendix A, which is attached hereto and made a part hereof.

43. Within fifteen (15) days after receipt of the Department's written comments on the draft TCDD Work Plan, Givaudan shall modify the draft TCDD Work Plan as necessary to conform to the Department's comments and shall submit the modified TCDD Work Plan to the Department for its approval.

44. Within seventy-five (75) days after receipt of the Department's written approval of the modified TCDD Work Plan, Givaudan shall conduct and complete the work described in the TCDD Work Plan and shall prepare and submit to the Department for its review and approval a draft TCDD feasibility study (hereinafter, the "Feasibility Study").

45. Within thirty (30) days after receipt of the Department's written comments on the draft Feasibility Study, Givaudan shall modify the draft Feasibility Study as necessary to conform to the Department's comments and shall submit the modified Feasibility Study to the Department for public hearing and approval.

46. At such time and place as the Department may establish, and upon reasonable notice to Givaudan, the Department shall conduct a public hearing with respect to the Feasibility Study. After taking into consideration any comments received at the public hearing, the Department, after consultation with Givaudan, shall select a remedial action alternative for the Site from among the remedial action alternatives described in the Feasibility Study.

IV

The Remedial Action Plan For the Contaminated
<u>Process and Contaminated Non-Process Areas</u>

47. Within sixty (60) days after receipt of the Department's written selection of a remedial action alternative for the Site, Givaudan shall submit to the Department for its review and approval, a detailed draft TCDD remedial action plan (hereinafter, the "Remedial Action Plan"), including a complete cost estimate for the work to be performed and a detailed schedule to implement the selected alternative.

48. Within thirty (30) days after receipt of the Department's written comments on the draft Remedial Action Plan, Givaudan shall modify the draft Remedial Action Plan as necessary to conform to the Department's comments and shall submit the modified Remedial Action Plan to the Department for its approval.

49. Upon receipt of the Department's written approval of the Remedial Action Plan, Givaudan shall conduct and complete the work described in the Remedial Action Plan in accordance with the approved schedule contained therein.

50. If the results of the Remedial Action Plan indicate that TCDD is migrating into the environment at concentration levels which constitute a significant risk to public health or the environment (a condition which is not now believed to be the case), then within ten (10) days after the discovery of any such condition, Givaudan shall submit to the Department for its review and approval, a draft amendment to the Remedial Action Plan (hereinafter the

"Remedial Action Plan Amendment"), including a complete cost estimate and an implementation schedule to correct the adverse impacts of the migration and to prevent the migration from reoccurring in the future.

51. Within ten (10) days after receipt of the Department's written comments on the draft Remedial Action Plan Amendment, Givaudan shall modify the draft Remedial Action Plan Amendment as necessary to conform to the Department's comments and shall submit the modified Remedial Action Plan Amendment to the Department for approval.

52. Upon receipt of the Department's written approval of the Remedial Action Plan Amendment, Givaudan shall conduct and complete the work described in the Remedial Action Plan Amendment in accordance with the approved schedule contained therein.

53. Prior to the preparation and implementation of any such Remedial Action Plan Amendment, and subject to the approval of the Department, Givaudan shall take such interim measures as are necessary to control or minimize the migration of TCDD contamination into the environment.

V

Project Coordination

54. All documents required by the terms of this Administrative Consent Order to be submitted by Givaudan to the Department, and all comments or approvals to be provided by the Department to Givaudan pursuant to the terms of this Administrative Consent Order, as well as all non-routine correspondence, including correspondence relating to force majeure issues, shall be sent by certified mail, return receipt requested, or shall be hand delivered and duly receipted by the recipient.

55. All correspondence, reports, work plans and other writings submitted to the Department by Givaudan with respect to this Administrative Consent Order shall be sent, unless otherwise instructed by the Department, to:

Karen Jentis, Chief
Bureau of Case Management
Division of Hazardous Waste Management
CN 028
Trenton, New Jersey 08625

56. Written communications from the Department to Givaudan with respect to this Administrative Consent Order shall be sent to:

Dr. H. A. Brandman
Vice-President-Manufacturing
Givaudan Corporation
125 Delawanna Avenue
Clifton, New Jersey 07014

A copy of all such written communications shall be sent to:

William H. Hyatt, Jr., Esq.
Pitney, Hardin, Kipp & Szuch
163 Madison Avenue
CN 1945
Morristown, New Jersey 07960-1945

57. Within seven (7) days after the effective date of this Administrative Consent Order, Givaudan shall provide the Department with the name, title, address and telephone number of its designated Facility Coordinator, who shall be responsible for oversight on behalf of Givaudan of the implementation of this Administrative Consent Order, including all activities required herein. Givaudan shall have the right to change its Facility Coordinator at any time, provided Givaudan shall notify the Department in writing at least five (5) working days prior to any such change. If such advance notice is not feasible, notice shall be given to the Department by the best means and as far in advance as possible under the circumstances.

58. Givaudan shall allow the Department and its authorized representatives access to the Site at all times for the purpose of monitoring compliance with the terms of this Administrative Consent Order.

VI

Financial Requirements

A. Insurance

59. Givaudan shall use its best efforts to secure and maintain in force during the pendency of this Administrative Consent Order, a comprehensive general liability insurance policy with coverage as broad as the standard coverage form currently in use in the State of New Jersey which shall not be circumscribed by the endorsements limiting the breadth of coverage. The policy shall include an endorsement (broad form) for contractual liability, an endorsement for completed operations liability, an endorsement of Broad Form Property Damage Coverage and an endorsement for independent contractors coverage. Givaudan shall use its best efforts to have its underwriter(s) add and maintain the State of New Jersey as an additional insured through completion of the Remedial Action Plan to be implemented pursuant to this Administrative Consent Order. The policy shall be specifically endorsed to eliminate any exclusions for explosion, collapse and underground hazards (x,c,u). Limits of liability shall be not less than Six Million Dollars ($6,000,000.00) per occurrence and annual aggregate for bodily injury and for property damage combined.

60. If Givaudan is able to obtain the insurance policy described in paragraph 59 above, as soon thereafter as that insurance policy described in the preceding paragraph can be obtained by Givaudan, Givaudan shall provide the Department with a current certificate of insurance certifying coverage. The certificate shall contain a provision that the insurance shall not be cancelled for any reason except after thirty (30) days written notice to the Department.

61. If Givaudan is not able to obtain or maintain the insurance policy described in paragraph 59 above, Givaudan shall indemnify the State to the same extent that the insurance coverage would have provided the State as an additional insured.

B. Financial Assurance

62. Within thirty (30) days after the effective date of this Administrative Consent Order, Givaudan shall obtain and provide to the Department an irrevocable, conditional letter of credit in the amount of One Million Dollars ($1,000,000) (hereinafter, the "Letter of Credit") to secure performance of all its obligations under this Administrative Consent Order and under the Ground Water Consent Order. The Letter of Credit shall be issued by a New Jersey bank or financial institution, or by such other bank or financial institution as shall be approved by the Department. Subject to the provisions of paragraph 64 and 65 of this Administrative Consent Order, Givaudan shall maintain the Letter of Credit continuously in full force and effect until the requirements of this Administrative Consent Order and the Ground Water Consent Order have been completed.

63. The amount of the Letter of Credit has been determined by estimating the costs of implementing the requirements of this Administrative Consent Order and the requirements of the Ground Water Consent Order.

64. The Letter of Credit shall be conditioned that in the event the Department determines that Givaudan has failed to perform any of its obligations under this Administrative Consent Order or the Ground Water Consent Order, the Department may draw on the Letter of Credit; provided, however, that before any such draw can be made, the Department shall notify Givaudan in writing of the obligation(s) with which Givaudan has failed to comply, and Givaudan shall have a reasonable time, not to exceed thirty (30) days, to perform any such obligation(s).

65. If the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the Ground Water Consent Order at any time exceeds the amount of the Letter of Credit, Givaudan shall promptly cause the amount of the Letter of Credit to be increased so that the amount of the Letter of Credit is equal to the combined estimated costs of implementing the Remedial Action Plans described in this Administrative Consent Order and the Ground Water Consent Order.

66. At any time during the performance of its obligations hereunder, Givaudan may apply to the Department for approval to reduce the amount of the Letter of Credit to reflect the remaining estimated combined costs of performing its obligations under this Administrative Consent Order and the Ground Water Consent Order, or to substitute other financial assurance in a form and manner acceptable to the Department.

67. Givaudan shall increase the amount of the Letter of Credit, or other approved financial assurance, within fifteen (15) days of its receipt of a written notice from the Department, to reflect increases in the estimated cost of implementing the approved remedial action alternative.

j. a review, provided by the Department of any off-site storage, treatment or disposal facility to ensure compliance with applicable hazardcus waste regulatory requirements

k. describe which federal, state and local permits would be necessary for each alternative identified and the information necessary for the development of each of the permits

l. time required for implementation, including interim dates of significance

C. Evaluation of Alternatives

1. evaluate and present the alternative remedies identified in Part B above and recommend the most environmentally sound alternative(s)

a. develop a health and environmental assessment

i. evaluate each alternative considering environmental fate, exposure and associated health and environmental effects

ii. analyze mitigating adverse effects, and physical or legal constraints

b. develop a detailed cost summary for each remedial action alternative, and for each phase or segment of the alternative

i. present the cost as a present-worth cost

ii. include total cost of implementing the alternative including the annual operation and maintenance costs of the alternative for the full duration of the alternative

c. evaluate each alternative in accordance with the criteria established in Part A above

i. apply the evaluation criteria uniformly to each alternative

ii. identify a number of remedial alternatives that are comparable

iii. identify the most appropriate alternative, given the specific constraints of the project

iv. prepare a trade-off matrix that enables identification of now comparable techniques including

- level of cleanup achievable

- time to achieve cleanup

- feasibility
- implementability
- reliability
- ability to minimize adverse impacts during action
- ability to minimize off-site impacts caused by action
- remoteness of activities
- useability of ground water
- useability of surface water
- useability of site

d. recommend the alternative that is the most environmentally sound resulting from Sections II. C.1.b. and C.1.c.

   i. prepare rationale for recommending the selected alternative stating the advantages over other alternatives considered

   ii. a conceptual design of the recommended alternative should be included, providing, as a minimum, the following information:

      - the selected engineering approach with implementation schedule
      - any special implementation requirements
      - applicable design criteria
      - preliminary site layouts
      - estimates of all costs, including operation and maintenance requirements
      - safety plan

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State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT
John J. Trela, Ph.D., Director
401 East State St.
CN 028
Trenton, N.J. 08625
609 - 633 - 1408

IN THE MATTER OF	:	AMENDED
	:	ADMINISTRATIVE
GIVAUDAN CORPORATION	:	CONSENT ORDER
	:	TCDD

The following FINDINGS are made and ORDER is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (the "Department" or "NJDEP") by Executive Order No. 40B (1983), signed by Governor Thomas H. Kean on June 17, 1983, N.J.S.A. App. A:9-45, N.J.S.A. 13:1D-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq., and duly delegated to the Assistant Director of Hazardous Waste Management pursuant to N.J.S.A. 13:1B-4.

FINDINGS

1. Givaudan Corporation (hereinafter "Givaudan") owns and operates an office, manufacturing, packaging, storage, shipment and research complex on 31.43 acres on Delawanna Avenue, Clifton, New Jersey (hereinafter "the Givaudan Plant"). The Givaudan Plant includes a chemical manufacturing facility located to the south of Delawanna Avenue, at 125 Delawanna Avenue (Block 73-3, Lot 2) (hereinafter "the Site").

2. Givaudan is an existing hazardous waste facility pursuant to N.J.A.C. 7:26-12.3, EPA ID No. NJD002156354.

3. Givaudan is required to investigate and remediate 2,3,7,8-Tetrachlorodibenzo-p-dioxin (hereinafter "TCDD" or "dioxin") in or on the soil at the site pursuant to an Administrative Consent Order (hereinafter "TCDD ACO") executed with the Department on March 5, 1987.

4. Givaudan plans to renovate a portion of the Contaminated Process Area, as defined by the TCDD ACO. This specific portion of the Contaminated Process Area is located north of building 68 where sample #G-11 was collected. The renovations would include the removal of a wall and underlying footings adjacent to this area of contamination (hereinafter "Sample Area #G-11") which is within the Contaminated Process Area. This

will necessitate removal of dioxin contaminated soil within Sample Area #G-11.

5. On August 31, 1987, Givaudan submitted a proposal and request (hereinafter "the proposal"), set forth in Appendix A-1, which is attached hereto and made a part hereof, that the Department grant permission under the TCDD ACO for Givaudan to conduct a limited excavation and remediation of dioxin contaminated soil (hereinafter "contaminated soil") of Sample Area #G-11 as described in Appendix A-1 and identified in Drawing A9565 (Rev. #2) of that Appendix.

6. Based upon these Findings, the Department has determined it is necessary to amend the TCDD ACO.

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED AND AGREED THAT:

7. Givaudan may perform the limited excavation and remediation of the contaminated soil within Sample Area #G-11, provided that Givaudan complies with the provisions of this Amended TCDD ACO.

8. Paragraph 36 of the TCDD ACO shall be amended to read as follows: Except for the limited excavation and remedial action in Sample Area #G-11 allowed pursuant to this Amended TCDD ACO, Givaudan shall continue to maintain all areas of the Site where analytical results have indicated the presence of TCDD contamination in concentrations of 1 ppb or more in a closed and secured condition, with physical access thereto restricted.

9. Paragraph 37 of the TCDD ACO shall be amended to read as follows: Except for the limited excavation and remedial action in Sample Area #G-11, Givaudan shall not engage in any demolition, excavation, movement or disturbance of soil, or placing, movement or removal of construction materials or construction equipment in the Contaminated Process and Non-Process Areas without prior written permission from the Department.

10. The contaminated soil excavated from Sample Area #G-11 shall be addressed in accordance with paragraph 42 of the TCDD ACO. The draft work plan to conduct a feasibility study of remedial action alternatives for TCDD contamination in the Contaminated Process and Contaminated Non-Process Areas (hereinafter, the "TCDD Work Plan"), based on the scope of Work set forth in Appendix A shall also address the excavated contaminated soil secured in the execution of Appendix A-1.

11. Excavation in the contaminated process area will be conducted in Sample Area #G-11 to a depth of three (3) feet. The contaminated soil will be containerized as it is excavated. Post-excavation sampling will be conducted to determine the level of TCDD in the soil from within the excavated area. Three (3) discrete samples will be taken from within the excavated area and analyzed to determine the level of TCDD in the newly uncovered soil.

12. The excavated area will be cordoned off and easily identifiable to plant personnel subsequent to the excavation until the results of the analysis have been obtained and submitted to the Department confirming the absence of TCDD or the presence of TCDD at levels less than 1 ppb.

13. If the analysis, set forth in paragraph 11, detects levels of TCDD in excess of the 1 ppb action level, additional excavation may be necessary as determined by NJDEP.

14. If the analysis, referred to in paragraph 11, indicates levels of TCDD 1 ppb or less, the boundary of the contaminated process area will be redefined as outlined in Appendix A-1.

15. All contaminated soil shall be secured in containers meeting the standards specified in N.J.A.C. 7:26-7.2 and such containers shall be securely sealed so that there is no escape of the contaminated soil.

16. All the containers containing the contaminated soil shall be secured in such a manner as to prevent their exposure to wind, rain or other forms of precipitation. Measures shall be undertaken to keep these containers dry at all times and to prevent precipitation from accumulating on or near the containers.

17. Within sixty (60) days of the execution of this Amended Administrative Consent Order, Givaudan's contingency plan and emergency procedures document, dated May 30, 1986, shall be amended to include the storage area and the containers utilized for the storage of the dioxin contaminated soil. Additionally, the contaminated areas of the process and non-process areas must also be identified in the amended contingency plan and emergency procedures document.

18. All containers containing the contaminated soil shall be handled and maintained in accordance with N.J.A.C. 7:26-9.4 (d) 1-6.

19. Written logs, which include the necessary procedures to detect cracks, leaks, and disturbances of the containers and/or storage area shall be maintained monthly. Immediately notify the Department at (609) 292-5560 during business hours or (609) 292-7172 at all other times should there be a disturbance of the containers and/or storage area. Verbal notification will be followed by written notification detailing the circumstances of the incident and outline measures that will be taken to prevent their reoccurrence.

20. Givaudan is required to maintain the containers and storage area in accordance with paragraphs 15 through 19 above. If the area utilized for storage of the containers of contaminated soil become disturbed in any way, Givaudan is required to perform remedial measures as necessary to secure the area and the contents of the containers in a manner consistent with paragraphs 15 through 18 within thirty (30) calendar days after the disturbance.

21. NJDEP has deemed that the temporary storage of this contaminated soil is necessary until appropriate treatment and/or disposal technologies become available. Givaudan may store the contaminated soil excavated from Sample Area #G-11 as required by this Amended Administrative Consent Order until a remedial action is chosen by the Department pursuant to the Remedial Action Plan or until such time dioxin treatment technology becomes available that is acceptable to the Department.

Force Majeure

22. If any event occurs which Givaudan believes will or may cause delay in the achievement of any provision of this Amended Administrative Consent Order, Givaudan shall notify the Department in writing within seven (7) calendar days of the delay or anticipated delay, as appropriate, referencing this paragraph and describing the anticipated length of the delay, the precise cause or causes of the delay, any measures taken or to be taken to minimize the delay. Givaudan shall take all necessary action to prevent or minimize such delay.

23. If the Department finds that: (a) Givaudan has complied with the notice requirements of the preceding paragraph and; (b) that any delay or anticipated delay has been or will be caused by fire, flood, strike or other circumstances beyond the control of Givaudan, the Department shall extend the time for performance hereunder for a period no longer than the delay resulting from such circumstances. If the Department determines that either Givaudan has not complied with the notice requirements of the preceding paragraph, or the event causing the delay is not beyond the control of Givaudan, failure to comply with the provisions of this Amended Administrative Consent Order shall constitute a breach of the requirements of this Amended Administrative Consent Order. The burden of proving that any delay is caused by circumstances beyond the control of Givaudan and the length of any such delay attributable to those circumstances shall rest with Givaudan. Increases in the cost or expenses incurred by Givaudan in fulfilling the requirements of this Amended Administrative Consent Order shall not be basis for an extension of time. Delay in an interim requirement shall not automatically justify or excuse delay in the attainment of subsequent requirements.

General Provisions

24. This Amended Administrative Consent Order shall be binding on Givaudan, its principals, directors, officers, agents, successors, assignees and any trustee in bankruptcy or receiver appointed pursuant to a proceeding in law or equity.

25. Givaudan shall perform all work conducted pursuant to this Amended Administrative Consent Order in accordance with prevailing professional standards.

26. Givaudan shall conform all actions pursuant to this Amended Administrative Consent Order with all applicable Federal, State, and local

laws and regulations. Givaudan shall be responsible for obtaining all necessary permits, licenses and other authorizations.

27. All appendices referenced in this Administrative Consent Order, as well as all other reports and documents required under the terms of this Amended Administrative Consent Order are, upon approval by the Department, incorporated into this Amended Administrative Consent Order by reference and made a part hereof.

28. Givaudan shall make available to the Department all data and information, including raw sampling and monitoring data, concerning pollution at and/or emanating from the site.

29. Givaudan shall make available to the Department all technical records and contractual documents maintained or created by Givaudan or its contractors in connection with this Amended Administrative Consent Order.

30. Givaudan shall preserve, during the pendency of this Amended Administrative Consent Order and for a minimum of six (6) years after its termination, all data, records and documents in their possession or in the possession of their divisions, employees, agents, accountants, contractors, or attorneys which relate in any way to the implementation of work under this Amended Administrative Consent Order, despite any document retention policy to the contrary. After this six year period, Givaudan shall notify the Department within twenty-eight (28) days prior to the destruction of any such documents. If the Department requests in writing that some or all of the documents be preserved for a longer time period, Givaudan shall comply with that request. Upon request by the Department, Givaudan shall make available to the Department such records or copies of any such records.

31. No obligations imposed by this Amended Administrative Consent Order are intended to constitute a debt, claim, penalty or other civil action which should be limited or discharged in a bankruptcy proceeding. All obligations imposed by this Amended Administrative Consent Order shall constitute continuing regulatory obligations imposed pursuant to the police powers of the State Of New Jersey intended to protect human health of the environment.

32. In addition to the Department's statutory and regulatory rights to enter and inspect, Givaudan shall allow the Department and its authorized representatives access to the site at all times for the purpose of monitoring Givaudan's compliance with this Amended Administrative Consent Order.

33. The Department reserves the right to require Givaudan to take additional actions should the Department determine that such actions are necessary to protect human health or the environment. Nothing in this Amended Administrative Consent Order shall constitute a waiver of any statutory right of the Department pertaining to any of the laws of the State of New Jersey should the Department determine that such measures are necessary.

34. Givaudan shall not construe any informal advice, guidance, suggestions, or comments by the Department, or by persons acting on behalf

of the Department, as relieving Givaudan of its obligation to obtain written approvals as may be required herein, unless such advice, suggestions, guidance, or comments by the Department shall be submitted in writing to Givaudan pursuant to paragraph 54 of the TCDD ACO. except for minor modifications during field activities, including minor schedule adjustments, which Givaudan shall confirm in writing to the Department.

35. No modification or waiver of this Amended Administrative Consent Order shall be valid except by written amendment to this Amended Administrative Consent Order duly executed by Givaudan and the Department.

36. Givaudan hereby consents to and agrees to comply with this Amended Administrative Consent Order which shall be fully enforceable as an Order in the New Jersey Superior Court upon the filing of a summary action for compliance pursuant to Executive Order No. 40 (1983) signed by Governor Thomas H. Kean on June 2, 1983, N.J.S.A. App. A:9-45, N.J.S.A. 13:1D-1 et seq., the Water Pollution Control Act N.J.S.A. 58:10A-1 et seq., the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq.

37. Givaudan agrees not to contest the authority or jurisdiction of the Department to issue this Amended Administrative Consent Order and also agrees not to contest the terms of this Amended Administrative Consent Order in any action to enforce its provisions.

38. Givaudan shall give written notice of this Amended Administrative Consent Order to any successor in interest prior to transfer of ownership of Givaudan's facilities which are the subject of this Amended Administrative Consent Order, and shall simultaneously verify to the Department that such notice has been given.

39. The requirements of this Amended Administrative Consent Order shall be deemed satisfied upon the receipt by Givaudan of written notice from the Department that Givaudan has demonstrated, to the satisfaction of the Department, that all the terms of this Amended Administrative Consent Order have been completed.

40. All terms and conditions of the TCDD ACO not inconsistent with this amendment shall remain in full force and effect.

Hearing Waiver

41. When this Amended Administrative Consent Order becomes effective, Givaudan Corporation waives its right to a hearing on the matters contained herein above pursuant to N.J.S.A. 52:14B-1 et seq.

42. This Amended Administrative Consent Order shall take effect upon the signature of both parties.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DATE: 2-16-88 BY: Ronald T. Corcory

Ronald T. Corcory
Assistant Director for Enforcement
Division of Hazardous Waste Management

GIVAUDAN CORPORATION

DATE: 2-9-88 BY:

NAME R J Christensen

TITLE Exec V.P. Gen Mgr.

NAME M. Marcus

TITLE Sr. V.P. R&D

Approved as to Form
R Tavares Date 2-9-88

932790369

APPENDIX A-1

GIVAUDAN PROPOSAL
AUGUST 31, 1987

GIVAUDAN

GIVAUDAN CORPORATION
Delawanna Avenue
Clifton, New Jersey 07015-5034
Phone: (201) 365-8000
Cable: Givaudanco, Clifton
Telex: 219259 (Headquarters)
Telex: 133501 (Plant)
Facsimile:. (201) 777-9304

RECEIVED SEP 2 1987

August 31, 1987

Mr. Joseph Karpa, Case Manager
State of New Jersey
Dept. of Environmental Protection
Div. of Hazardous Waste Management
401 East State Street
CN 028
Trenton, N. J. 08625

Dear Mr. Karpa:

Thank you for taking the time to visit the Givaudan Corporation on August 19, 1987. As you will recall, Givaudan is in the midst of major modernization in order to have a modern, environmentally sound, manufacturing facility.

Paragraph 28 of the T.C.D.D. Administrative Consent Order states that, "... The department agreed that the site is released from the restrictions of the Administrative Consent Order with the exceptions of (a) the contaminated process area and the contaminated non-process area, ...". In compliance with this paragraph, all work to date, has been outside the contaminated process and contaminated non-process areas, (identified by Drawings #A9565, Rev. 1 and #9566, Rev. 1). In order to continue with the above mentioned modernization, it is planned to construct a new building on the southern border of the presently defined contaminated process area. As part of this construction, it will be necessary to install new footings necessitating the movement of soil in this area.

Therefore, the Givaudan Corporation is requesting permission, under the T.C.D.D. Administrative Consent Order, to perform the above work.

Enclosed is a copy of Drawing #A9565, Rev. #2, where the area is identified. In examining this print, please note that a sample, taken from the area north of Bldg. 68 (#G-11), (red shaded area), was found to have a T.C.D.D. level of 2.2 p.p.b. The areas northwest of Bldg. 68 and north of Bldg. 68A (green shaded areas) have been found to contain less than 1.0 p.p.b. T.C.D.D.

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Based on these facts, the following is proposed:

1) The area north of Bldg. 68 (shaded in red, containing sample #G-11), will be excavated to a depth of 3 feet. (Based on all previous sampling at the Givaudan site, there is no indication that dioxin has migrated to this depth).

2) Employees engaged in the excavation will be required to wear "Level C" protection. The area to be excavated will be moistened to control dusting. The majority of the excavation will be performed utilizing a backhoe and shovels. The soil obtained from the excavation will be placed in sealed open-head 55-gallon drums and temporarily stored in the contaminated non-process area. It is anticipated that the excavation of the red shaded area will require the storage of approximately 144 cubic yards of contaminated soil requiring the use of approximately 200 drums. Upon reaching a depth of 3 feet, a composite sample will be taken and forwarded to California Analytical Labs. for T.C.D.D. analysis to insure that the excavated area contains <1 p.p.b. T.C.D.D.

   Upon completion of the excavation, all utensils and backhoe bucket will be decontaminated using a soap and water wash followed by a distilled water wash, acetone rinse and hexane rinse. All clothing and disposable utensils will be placed in an open-head 55-gal. drum and stored in Bldg. 54 pending disposal. No additional work will be performed on the north side of Building 68 which would disturb any soil prior to approval by the N.J.D.E.P.

3) Following the completion of the above, the boundaries of the contaminated process area would be altered as defined by the dashed line on Drawing A9565, Rev. 2.

Your prompt review and approval of the above proposal will be appreciated since construction in this area of the Givaudan plant site is critical in order to maintain the construction schedule.

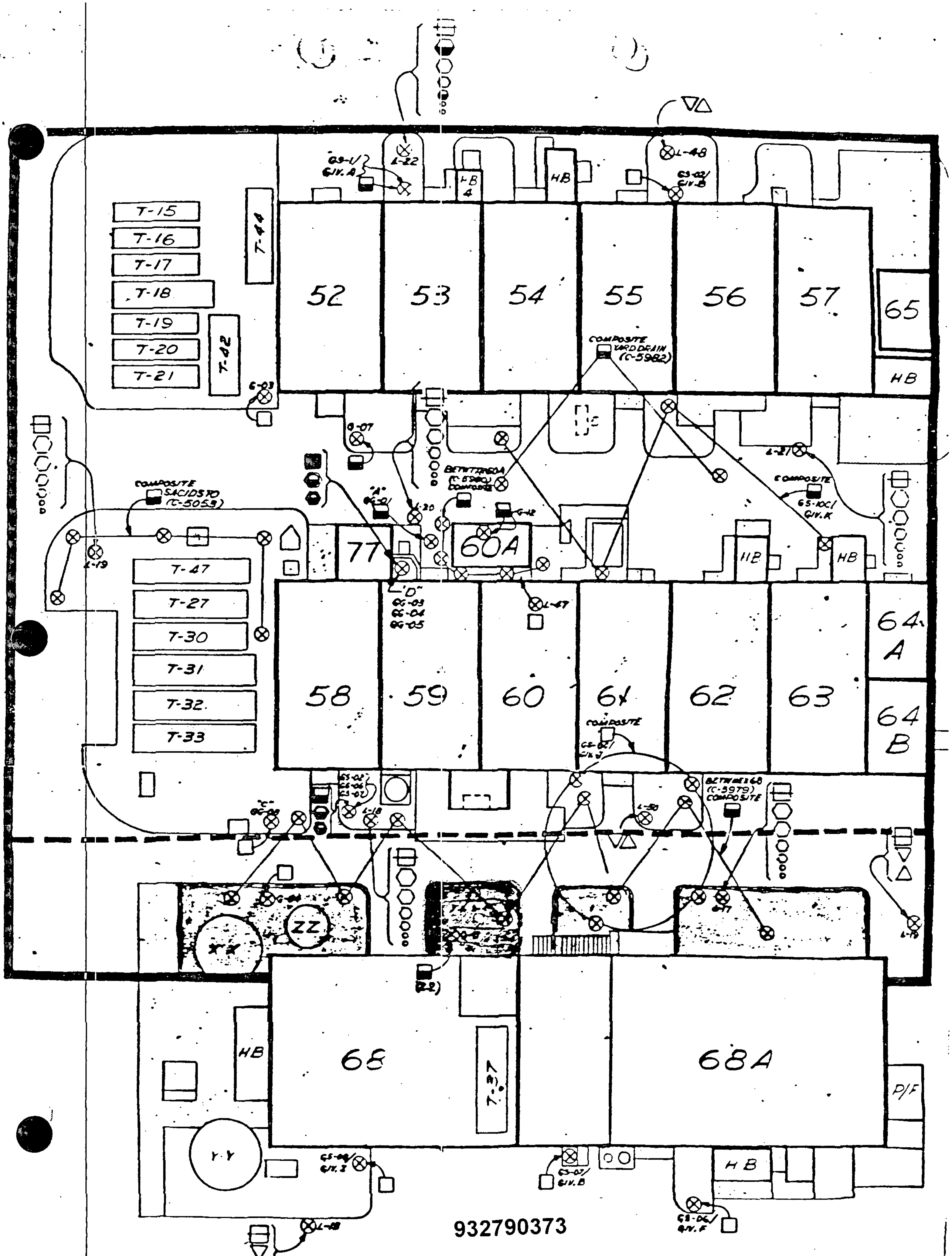
Thank you in advance for your cooperation.

Sincerely,

GIVAUDAN CORPORATION

L. A. Levy
Director, Quality Assurance

LAL/rd
ACORL-KA.AU7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T-16
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T-18
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T-21
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T-42
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54
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56
57
65
HB
COMPOSITE YARD DRAIN (C-5982)
L-22
L-48
T-47
T-27
T-30
T-31
T-32
T-33
77
60A
58
59
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62
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64 A
64 B
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68A
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P/F
Y-Y
ZZ
XX

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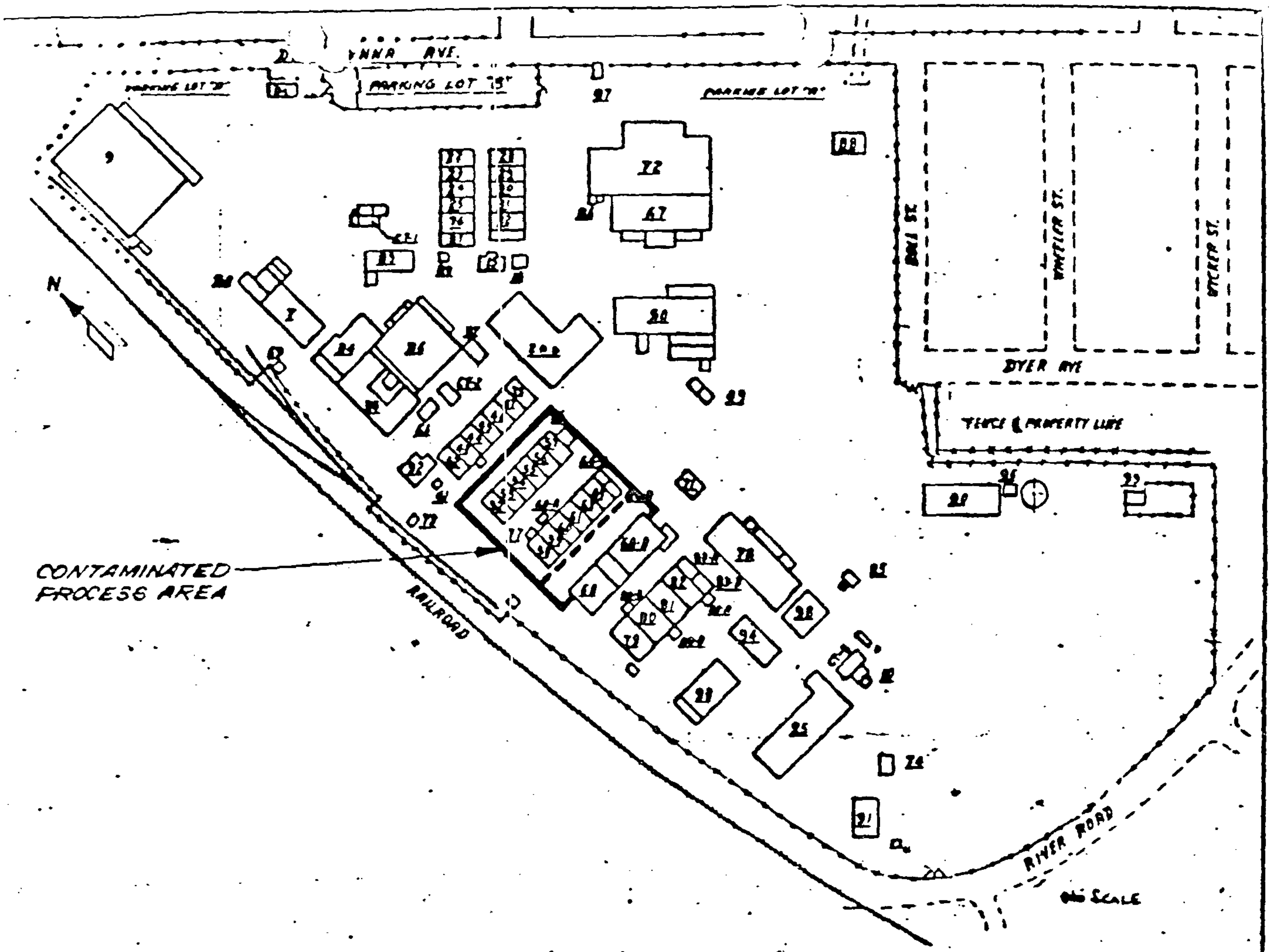

KEY PLAN

LEGEND

SAMPLE LOCATION

SAMPLE TYPE

SURFACE (0-6 WAFER)
4-6" WAFER
10-12" WAFER
16-18" WAFER
22-24" WAFER
28-30" WAFER
34-36" WAFER

SURFACE
COMPOSITE (4-6, 10-12, 16-18" WAFERS)
COMPOSITE (22-24, 28-30, 34-36" WAFERS.

DEPTH COMPOSITE

CORE COMPOSITES

6" 0-6"
12" 6-12"
24" 12-18"

NO SAMPLE

NOT ANALYZED

DIOXIN LEVELS ppb

>10
7-10
-<7
<1.

DRWG NO	DESCRIPTION	DRWG NO	DESCRIPTION

REFERENCE DRAWINGS

NO	BY	DATE	DESCRIPTION	PLT MGR	PROD	SAFETY
2	G.D.	7-8-87				
1	G.D.	5-19-87				

REVISIONS

THIS DRAWING AND ALL INFORMATION THEREON IS THE PROPERTY OF GIVAUDAN CORP. AND IS CONFIDENTIAL AND MUST NOT BE MADE PUBLIC OR COPIED UNLESS AUTHORIZED BY THEM AND IS SUBJECT TO RETURN UPON DEMAND

CONTAMINATED PROCESS AREA SAMPLING & ANALYSIS STATUS 1984

GIVAUDAN CORPORATION
CLIFTON, NEW JERSEY

DEPT ENVIR.					
BLDG					
DATE 12-13-84	DRAWN BY ERH	APP'D	JOB NOS	DRAWING NO. A-9565 (REV. #2)	REV. 2
SCALE 1"=20'-0"	CHECKED	FILE			

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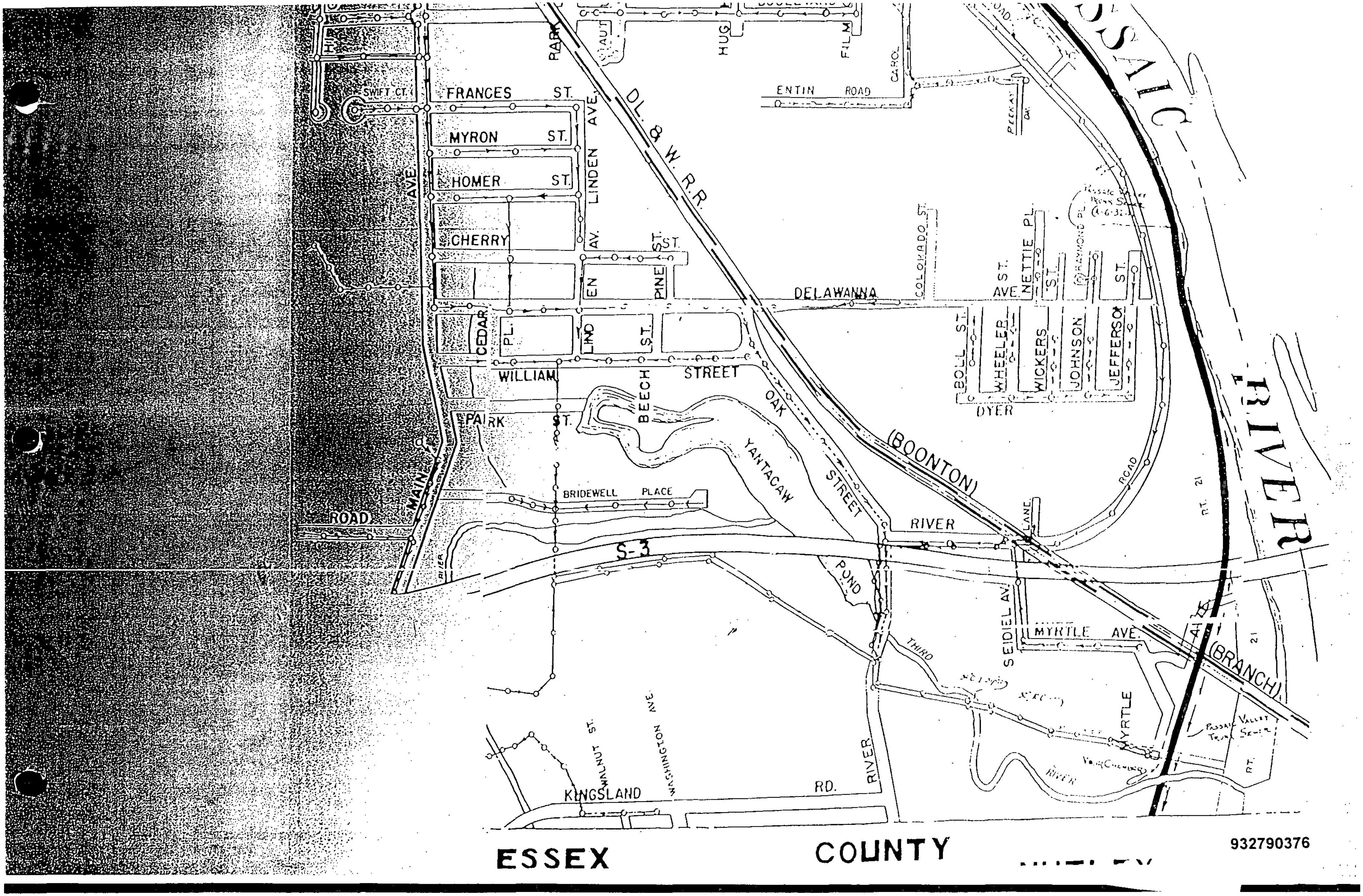
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SWIFT CT.
MYRON ST.
HOMER ST.
CHERRY
LINDEN AVE.
PARK
DL & W. R.R.
ENTIN ROAD
HUG
FILM
CAROL
PASSAIC
RIVER
COLORADO ST.
DELAWANNA AVE.
NETTIE PL.
PINE ST.
CEDAR PL.
LIND ST.
BOLL ST.
WHEELER
WICKERS
JOHNSON
JEFFERSON
DYER
WILLIAM STREET
BEECH
OAK STREET
PARK ST.
YANTACAW
(BOONTON)
ROAD
MAIN AVE.
BRIDEWELL PLACE
RIVER
LANE
ROAD
S-3
POND
SEIDIEL AV.
MYRTLE AVE.
(BRANCH)
THIRD
RT. 21
MYRTLE
RIVER
WALNUT ST.
WASHINGTON AVE.
KINGSLAND RD.
ESSEX COUNTY

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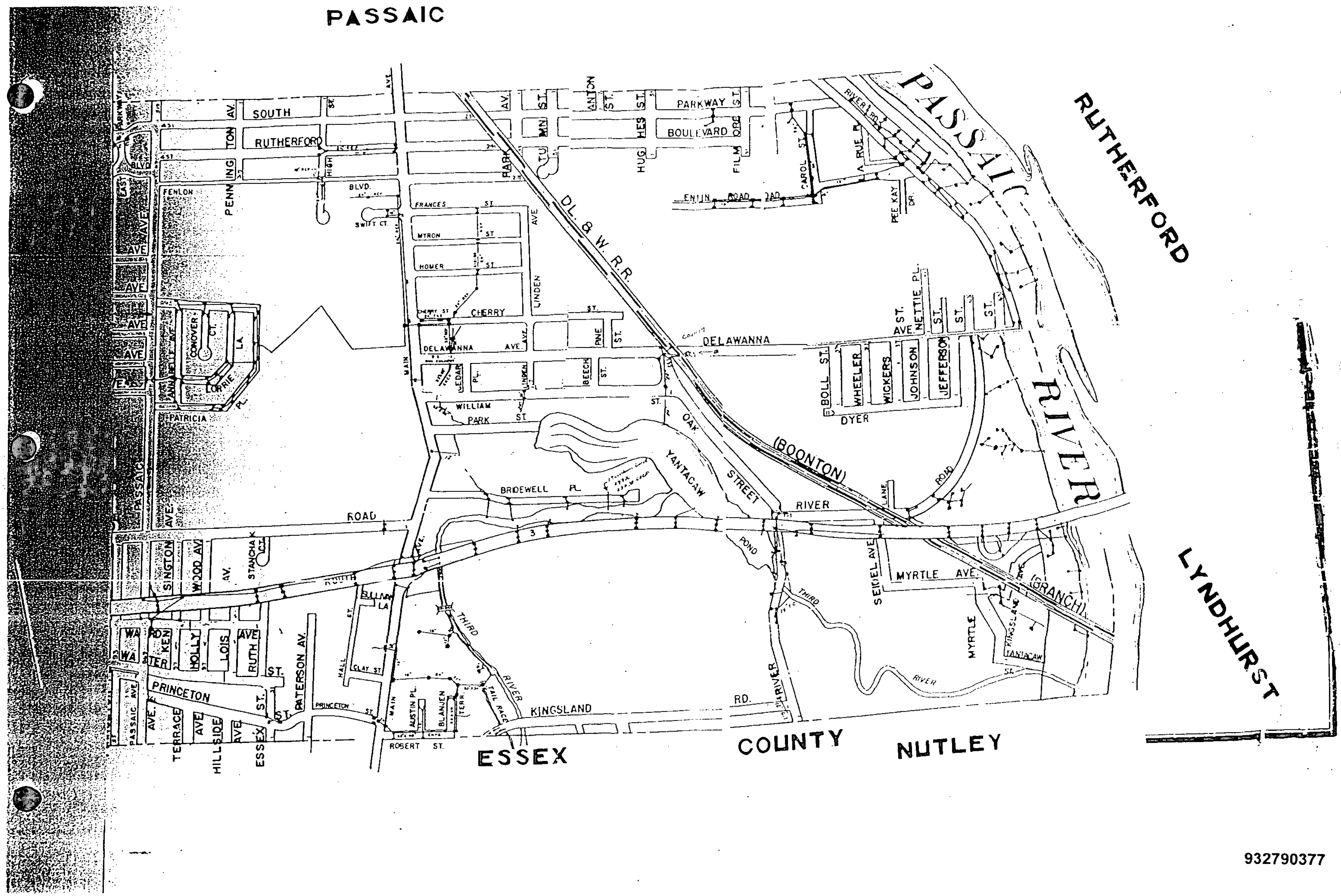
PASSAIC
RUTHERFORD
LYNDHURST
ESSEX
COUNTY
NUTLEY
PASSAIC RIVER
DL. & W. R.R.
(BOONTON)
(BRANCH)
SOUTH
RUTHERFORD
BLVD.
PARKWAY
BOULEVARD
FENLON
PENNINGTON AV.
FRANCES ST.
MYRON ST.
HOMER ST.
CHERRY ST.
DELAWANNA AVE.
DELAWANNA
CEDAR
LINDEN
PINE
BEECH ST.
WILLIAM
PARK ST.
PATRICIA
CONOVER CT.
LORRIE
MAIN
OAK STREET
YANTACAW
BRIDEWELL PL.
ROAD
RIVER
ROUTE 3
POND
BOLL ST.
WHEELER
WICKERS
JOHNSON
JEFFERSON
DYER
NETTIE PL.
PEE KAY DR.
CAROL ST.
SEIDEL AVE
MYRTLE AVE.
MYRTLE
KINGSLAND
TANTACAW
THIRD RIVER
TAIL RACE
KINGSLAND RD.
PRINCETON
PRINCETON ST.
PATERSON AV.
HALL
CLAY ST.
AUSTIN PL.
BLANJEN TERR.
ROBERT ST.
TERRACE
HILLSIDE AVE
ESSEX
HOLLY
LOIS
RUTH
STANCHAK CT.
WOOD AV

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Givaudan Roure

Eugene A. Thomas
Director, EH&S Programs
Givaudan Roure Corporation
155 Passaic Avenue
Fairfield, NJ 07006
Direct Phone: 973-439-2123
Fax: 973-439-2236
Email: gene.thomas@roche.com

BBF000082

July 14, 1999

RECEIVED
JUL 16 1999

State of New Jersey
Department of Environmental Protection
401 East State Street
Trenton, NJ 08625
Attn: Ms. Maria Franco-Spera

Dear Ms. Franco-Spera

Enclosed is a copy of the deed notice for our north side property in Clifton that was recorded in the Passaic County Register's office on June 29, 1999 in Deed Book U161 at page 213.

Very truly yours,

Eugene A Thomas

Eugene A. Thomas
Director, Environmental Health and Safety Programs

EAT/mbf

(NJDEP-Recorded-Deed-NoticeJul99.doc)

CC: Rick Wroblewski - ERM

PITNEY, HARDIN, KIPP & SZUCH

(MAIL TO)
P.O. BOX 1945
MORRISTOWN, NEW JERSEY 07962-1945

(DELIVERY TO)
200 CAMPUS DRIVE
FLORHAM PARK, NEW JERSEY 07932-0950
(973) 966-6300
FACSIMILE (973) 966-1550

152 WEST 57TH STREET
NEW YORK, N.Y. 10019-3310
(212) 371-8880
FACSIMILE (212) 371-8540

THOMAS J. MALMAN

DIRECT DIAL NUMBER
973-966-8179

E-MAIL
TMALMAN@PHKS.COM

BBF000083

COPY

July 13, 1999

VIA Regular Mail

Kathleen G. O'Connor, Esq.
Givaudan Roure Corporation
155 Passaic Avenue
Fairfield, NJ 07004

Re: Clifton, New Jersey

Dear Kathy:

I have enclosed the original Deed Notice that was recorded in the Passaic County Register's office on June 29, 1999 in Deed Book U161 at page 213.

Please contact me if you have any questions concerning this matter.

Very truly yours,

THOMAS J. MALMAN

TJM
Enclosure
cc: David Johnson (w/enclosure)
Eugene Thomas (w/enclosure)

482455A01071399

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DEED NOTICE

RECEIVED
PASSAIC CO. N.J.

1999 JUN 29 A 10:16

IN ACCORDANCE WITH N.J.S.A. 58:10B-13, THIS DOCUMENT IS TO BE RECORDED IN THE SAME MANNER AS ARE DEEDS AND OTHER INTERESTS IN REAL PROPERTY.

REGISTER

T730465

Consideration $
Realty Transfer Fee
Recording Fee
By
Total$

Prepared by:

Eugene A Thomas

[Signature]

Eugene A. Thomas
Director, EH&S Programs

[Print name below signature]

Recorded by:

[Signature, Officer of County Recording Office]

[Print name below signature]

Pitney Harden Kipp
P.O. Box 1945
Morristown, N.J. 07962-1945

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--U161PG213

This Deed Notice is made as of the twenty-third day of June, 1999, by Givaudan Roure Corporation, 100 Passaic Avenue, Fairfield, New Jersey (together with his/her/its/their successors and assigns, collectively "Owner").

WITNESSETH:

WHEREAS, Owner is the owner in fee simple of certain real property designated as Givaudan Roure Corporation, Tax Block 60.14 and Tax Lots 22, 26, 27, 28, 29 and 30 on the tax map of the City of Clifton, Passaic County, New Jersey Department of Environmental Protection Known Contaminated Site List Number 3219, more particularly described on Exhibit A attached hereto and made a part hereof (the "Property"); and

WHEREAS, the lead program during the remediation was Bureau of Case Management and the program identification numbers were ISRA Case #97610 and Case ID #NJD982186413; and

WHEREAS, the New Jersey Department of Environmental Protection ("Department") approved a remedial action on 23 June 1999 for Case ID #NJD982186413 and ISRA Case #97610, in the matter of the Givaudan Roure Corporation, Remediation Agreement dated January 1, 1998, concerning the Property in which the Department has approved the use of institutional controls and engineering controls in accordance with N.J.S.A. 58:10B-13; and

WHEREAS, this Deed Notice itself is not intended to create any interest in real estate in favor of the Department, nor to create a lien against the Property, but merely is intended to provide record or deed notice of certain conditions and restrictions on the property and to reflect the regulatory and statutory obligations imposed as a condition of using institutional and/or engineering controls; and

WHEREAS, the areas described on Exhibit B attached hereto and made a part hereof (the "Affected Areas") contain contaminants above the applicable remediation standards that would allow for the unrestricted use of the Property; and

WHEREAS, the type, concentration and specific location of the contaminants are described on one or more diagrams, maps and/or tables on Exhibit B attached hereto and made part hereof; and

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WHEREAS, a narrative description of all institutional controls is provided in Exhibit C; and

WHEREAS, a narrative description of engineering controls and associated monitoring and maintenance activities is provided in Exhibit C; and

WHEREAS, to prevent the potential for migration of the contaminants and unacceptable risk of exposure to the contamination to humans or the environment, an existing building (103), paved parking surface and vegetative cover is in place at the Property, at the locations shown on Exhibit D; and

WHEREAS, to prevent the potential for unacceptable exposure to the contamination to humans or the environment, the existing building, paved parking surface, vegetative cover and a fence and posted sign(s) is in place at the Property, at the locations shown in Exhibit D on maps or diagrams; and

WHEREAS, in accordance with the Department's approval of the Site Investigation and Remedial Action Report for the Property, and in consideration of the terms and conditions of that approval, and other good and valuable consideration, Owner has agreed to subject the Property to certain statutory and regulatory requirements which impose restrictions upon the use of the Property, and to restrict certain activities at the Property, as set forth below.

NOW, THEREFORE, Owner agrees to the conditions and restrictions listed below and hereby notifies all interested parties, owners, lessees and operators that the applicable regulations and statutes require of such person while owning, leasing or operating the Property as follows:

1. RESTRICTED USES. The owner(s) of all or any fee interest in all or any portion of the Affected Areas and each operator of all or any portion of the Affected Areas, shall not allow any of the following uses of the following portions of the Affected Areas:

<u>Portion of the Affected Area</u>	<u>Restricted Use</u>
The Affected Area as identified in Exhibit B.	The use shall be restricted to *non-residential uses only and subject* to paragraphs 2 and 3.

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2. EMERGENCIES. In the event of an emergency which presents a significant risk to public health, safety, or the environment, the application of Paragraph 1 above may be temporarily and unilaterally suspended, by Owner, provided that the Owner:

i. Immediately notifies the Department of the emergency;

ii. Limits both the actual disturbance and the time needed for the disturbance to the minimum reasonably necessary to adequately respond to the emergency;

iii. Implements all measures necessary to limit actual or potential, present or future risk of exposure to humans or the environment to the residual contamination; and

iv. Restores the Affected Areas to the pre-emergency conditions to the extent reasonably possible, and provides a report to the Department of such emergency and restoration efforts within ninety (90) calendar days after the end of the emergency.

3. ALTERATIONS, IMPROVEMENTS, AND DISTURBANCES.

(a) Except as provided in Paragraph 2 above, no owner or operator shall make, or allow to be made, any alteration, improvement, or disturbance in, to, or about the Affected Areas which disturbs any engineering control or which creates an unacceptable risk of exposure of humans or the environment to contamination in the Affected Areas with-out first obtaining the express written consent of the Department. Nothing herein shall constitute a wavier of the Owner's or operator's obligation to comply with all applicable laws and regulations.

(b) Notwithstanding subparagraph 3(a) above, the Department's consent is not required for any alteration, improvement, or disturbance provided the Owner or operator:

i. Provides for restoration of any disturbance of an engineering control to pre-disturbance conditions within sixty (60) calendar days after the initiation of the alteration, improvement or disturbance; and

ii. Does not allow an exposure level above those noted under Restricted Uses, provided that all applicable worker health and safety laws and regulations are followed during the alteration, improvement, or disturbance.

4. ACCESS.

While this Deed Notice is in effect, the Owner agrees to allow the Department, its agents and representatives access to the property to inspect and evaluate the continued effectiveness of the institutional or engineering controls and to conduct additional remediation to ensure the protection of the public health and safety and the environmental.

5. NOTICE TO LESSEES AND OTHER HOLDERS OF PROPERTY INTERESTS.

Owner shall cause all leases, grants and other written transfers of interest in the Affected Areas to contain a provision expressly requiring all holders thereof to take the Property subject to the restrictions contained herein and to comply with all, and not to violate any of the conditions of this Deed Notice. Nothing contained in this Paragraph shall be construed as limiting any obligation of Owner to provide any notice required by any law, regulation or order of any governmental authority.

6. ENFORCEMENT OF VIOLATIONS.

The restrictions provided herein may be enforceable solely by the Department against any person who violates this Deed Notice. A violation of this Deed Notice shall not effect the status of the ownership of or title to the Property. To enforce violations of this Deed Notice, the Department may initiate one or more enforcement actions pursuant to N.J.S.A. 58:10-23.11u and require additional remediation and assess damages pursuant to N.J.S.A. 58:10-23.11g.

7. SEVERABILITY.

If any court of competent jurisdiction determines that any provision of this Deed Notice is invalid or unenforceable, such provision shall be deemed to have been modified automatically to conform to the requirements for validity and enforceability as determined by such court. In the event that the provision invalidated is of such a nature that this provision cannot be so modified, the provision shall be deemed deleted from this instrument as though it had never been included herein. In either case, the remaining provisions of this Deed Notice shall remain in full force and effect.

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8. SUCCESSORS AND ASSIGNS.

This Deed Notice shall be binding upon Owner and upon Owner's successors and assigns while each is an owner or operator of the Property and the Department.

9. REQUIREMENT OF NOTIFICATION.

The Owner shall notify any person who intends to excavate on the property of the nature and location of any contamination existing on the property and of any conditions or measures necessary to prevent exposure to contaminants.

10. TERMINATION AND MODIFICATION.

(a) This Deed Notice shall terminate only upon filing of an instrument, executed by the Department, in the office of the County Register of Passaic County, New Jersey, expressly terminating this Deed Notice.

(b) Any person may request in writing at any time that the Department modify or terminate this Deed Notice or initiate termination proceedings based on, for example, a proposal that the Property does not pose an unacceptable risk to public health and safety or the environment. Within ninety (90) calendar days after receiving such a request the Department will either:

i. Approve the request and have the Owner:

- Record with the office of the county recording officer a notice executed by the Department that the use of the Property is no longer restricted and the Deed Notice is terminated or record a modified Deed Notice delineating the new restrictions; and

- Provide written notice to each municipality in which the Property is located, with a copy to the Department, of the removal or change of the restrictions contained herein: or

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ii. Issue a written notification of intent to deny the request pursuant to (c) below.

(c) The Department will set forth in a notice of intent to deny a request to modify or terminate this Deed Notice the basis for its decision. The owner can respond to the intent to deny by providing new or additional information or data. The Department will review any such new or additional information or data and issue a final decision to grant or deny the request within sixty (60) calendar days after the Department's receipt of the owner's response.

IN WITNESS WHEREOF, Owner has executed this Deed Notice as of the date first written above.

[If Owner is a corporation]

ATTEST:

Givaudan Roure Corporation

[Name of corporation]

By DB Johnson

David Johnson

Vice President - Env. Health & Safety

[Print name below signature]

[If Owner is a general or limited partnership]

WITNESS:

[Name of partnership]

By

General Partner

[Print name and title]

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--U161PG219

EXHIBIT A – METES AND BOUNDS DESCRIPTION OF PROPERTY

The Deed Notice covers the entirety of certain real Property designated Givaudan Roure Corporation, Tax Block 60.14 and Tax Lots 22, 26, 27, 28, 29 and 30 on the tax map of the City of Clifton, Passaic county, New Jersey. The surveyed metes and bounds are attached as Exhibit A-1. A copy of the tax map outlining the Block and Lots is attached as Exhibit A-2, showing the location of the Deed Notice.

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Exhibit A-1
Surveyed Meets and Bounds

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--U16IPG221

LOTS 22, 26, 27, 28, 29 & 30 BLOCK 60-14, DELAWANNA AVENUE, CLIFTON

All that certain tract of land situated and lying in the City of Clifton, County of Passaic, State of New Jersey being bound and more particularly described as follows:

Beginning at a railroad spike in the northeasterly sideline of Delawanna Avenue and running thence

1. Along the easterly line of Lot 33 in Block 60-14 North 1° 15' 30" East 20.74 feet to a point, thence
2. Along the northeasterly line of said Lot 33North 19° 40' 30" West 69.97 feet to a point, thence
3. Along the easterly line of said Lot 33 North 1° 15' 30" East 364.00 feet to a point, thence
4. South 88° 44' 30" East 25.00 feet to a point, thence
5. South 1° 15' 30" West 124.30 feet to a point, thence
6. South 88° 44' 30" East 112.64 feet to a point, thence
7. North 1° 15' 30" East 36.66 feet to a point, thence
8. South 88° 44' 30" East 85.28 feet to a point, thence
9. South 4° 00' 50" East 27.97 feet to a point, thence
10. South 88° 44' 30" East 216.53 feet to a point, thence
11. Along the southwesterly line of Lot 18 in Block 60-14 South 48° 01' 30" East 9.87 feet to a point, thence
12. Along the southwesterly line of said Lot 18 and Lot 1 in Block 60-14 South 48° 12' 45" East 590.57 feet to a point, thence
13. Along the northwesterly sideline of Colorado Street (formerly) South 42° 31' 05" West 535.26 feet to a point in the northeasterly sideline of Delawanna Avenue, thence
14. Along the northeasterly sideline of Delawanna Avenue North 47° 23' 30" West 693.22 feet to the point and place of Beginning.

Containing 424,332 square feet; 9.7 acres more or less as described herein.

Subject to 25 foot wide right of way easement as per deed book P119-page 325, a right of ingress and egress to Lot 34 as per deed book K43 page 532, a 15 foot easement to PSE&G Co. as per deed book L132-page216 and any other easements of record.

This description is in accordance with a survey dated March 18, 1999 last revised June 7, 1999 prepared by Murphy and Hollows Associates, Civil Engineering and Surveying, 192 Central Avenue, Stirling, New Jersey 07980.

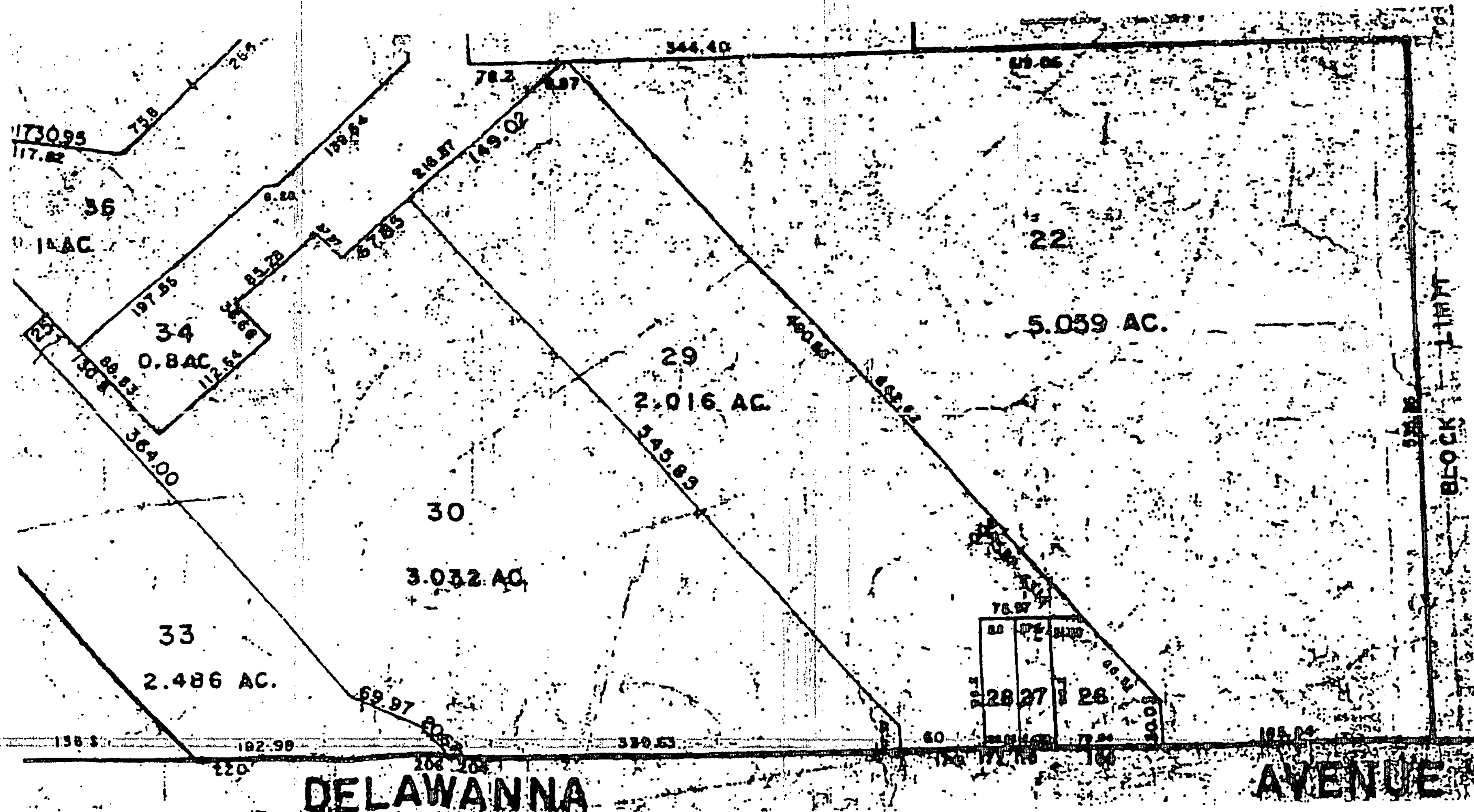
William G. Hollows, NJPE & LS #27473
June 21, 1999

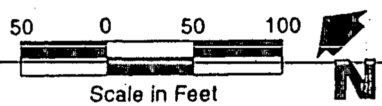
Exhibit A-2
Tax Map

932790392

--U161PG224

Exhibit A-2
Deed Notice Lots 22, 26, 27, 28, 29, 30
Block 60.14
Tax Map
Passaic County, New Jerey





Note: 22 Denotes lot number
Source: January 1986, City of Clifton Tax Map

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U161PG225

EXHIBIT B – DESCRIPTION OF THE AFFECTED AREA

The area subject to the restrictive covenant (hereinafter the Affected Area) is the real Property designated as Tax Block Number 60.14, Tax Lot numbers 22, 26, 27, 28, 29 and 30. The Affected Area beneath these Tax Lots consists of historical fill, consistent with the definition of historic fill found at NJAC 7:26E-1.8. The historic fill is found beneath the entirety of these parcels as determined by historical aerial photograph review, installation of soil borings, test pits, and monitoring wells. The Affected Area is shown on Exhibit B-1.

The Affected Area is bounded by Colorado Avenue on the east, Delawanna Avenue on the south, commercial property to the west, and an industrial park to the north. The historic fill in the Affected Area covers approximately 8 acres, or 346,253 square feet. The property contains a 47,952 square foot one story vacated warehouse with asphalt paving on the south and west sides, and a naturally vegetated, low-lying area on the eastern side of the property. The historic fill is encountered from ground surface to depths greater than 25 in some areas. Two cross-sectional views through this area are shown on Exhibit B-2. Within the fill, a number of volatile and semivolatile organic compounds are reported above their applicable soil cleanup criteria, as shown on Exhibit B-3. Such SVOCs include: Fluoranthene, Pyrene, Benzo(a)anthracene, Crysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, and Dibenzo(a,h)anthracene. The majority of these compounds are within the expected range of concentration for historic fill material. Perchloroethene (PCE) was detected in two borings at varying depths. The PCE data was evaluated with Compliance Averaging as allowed by the Department, and were found to be below standards by the Compliance Averaging approach.

All data presented in Exhibits B-1, B-2 and B-3 were collected consistent with the New Jersey Technical Requirements and analyzed by New Jersey certified laboratories.

All data presented have been provided to the Department prior to submitting this Deed Notice. The Affected Area will utilize the existing building (103), paved parking area, vegetative cover and fence as the engineering control to prevent access. More specific information regarding the engineering controls and the monitoring and maintenance plan proposed for the Affected Area is provided in Exhibit C.

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Exhibit B-1
Location of the Affected Area

932790395

--U161PG227

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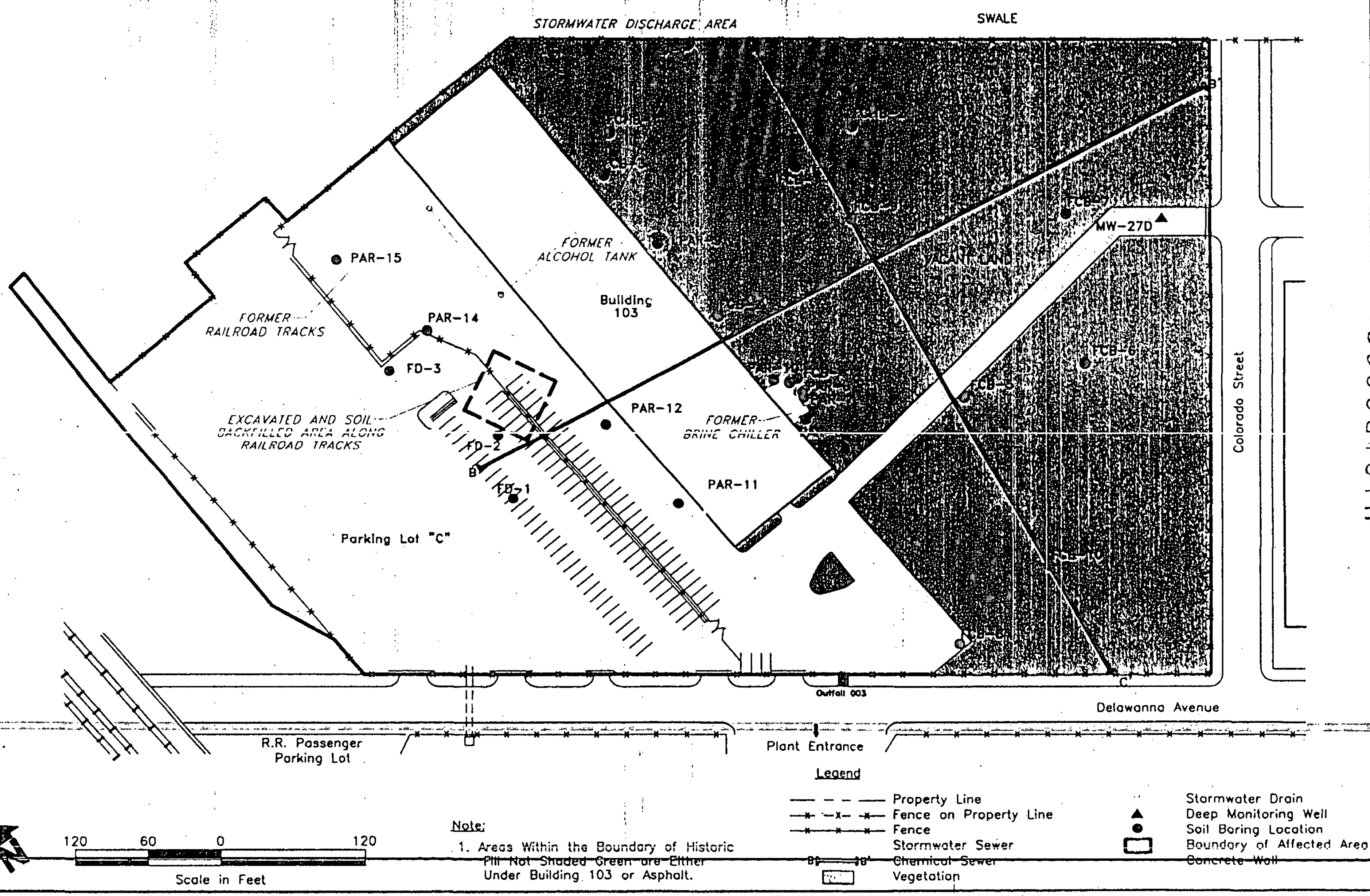
Exhibit B-1
Site Map with Areas of Potential Concern
Givaudan-Roure Corporation
Clifton, New Jersey



Note:
1. Areas Within the Boundary of Historic Fill Not Shaded Green are Either Under Building 103 or Asphalt.

ERM

22323.00.01/06.10.99-SCH/06.11.99-CMP/112-1C

Appendix B-2
Cross-Sections through Affected Area

--II I 6 I P 6 2 2 0

Cross Section B-B'
Givaudan-Roure Corporation
Clifton, New Jersey

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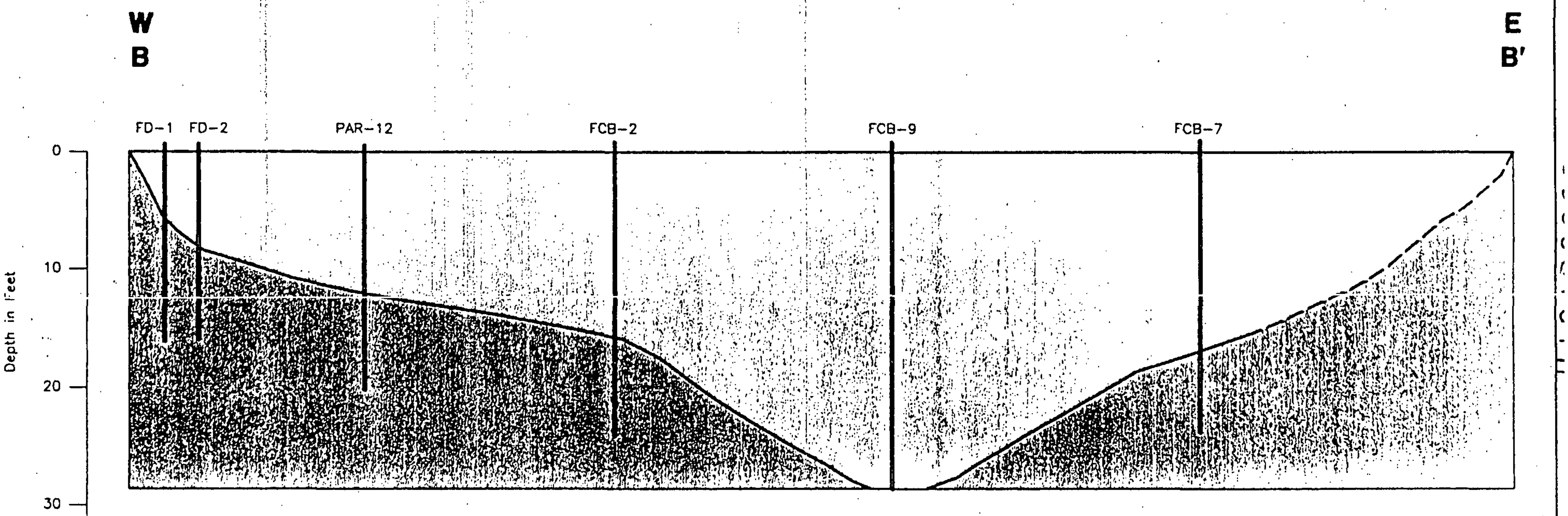


Fill Material
(Sand,Silt,Clay,Gravel and Assorted Debris)

Native Soil
(Sand,Silt, or Sand and Silt)

Lithological Contact Between Fill Material and Native Soil (Dashed where Inferred)

Vertical Exaggeration = 6x

80 40 0 80

Scale in Feet

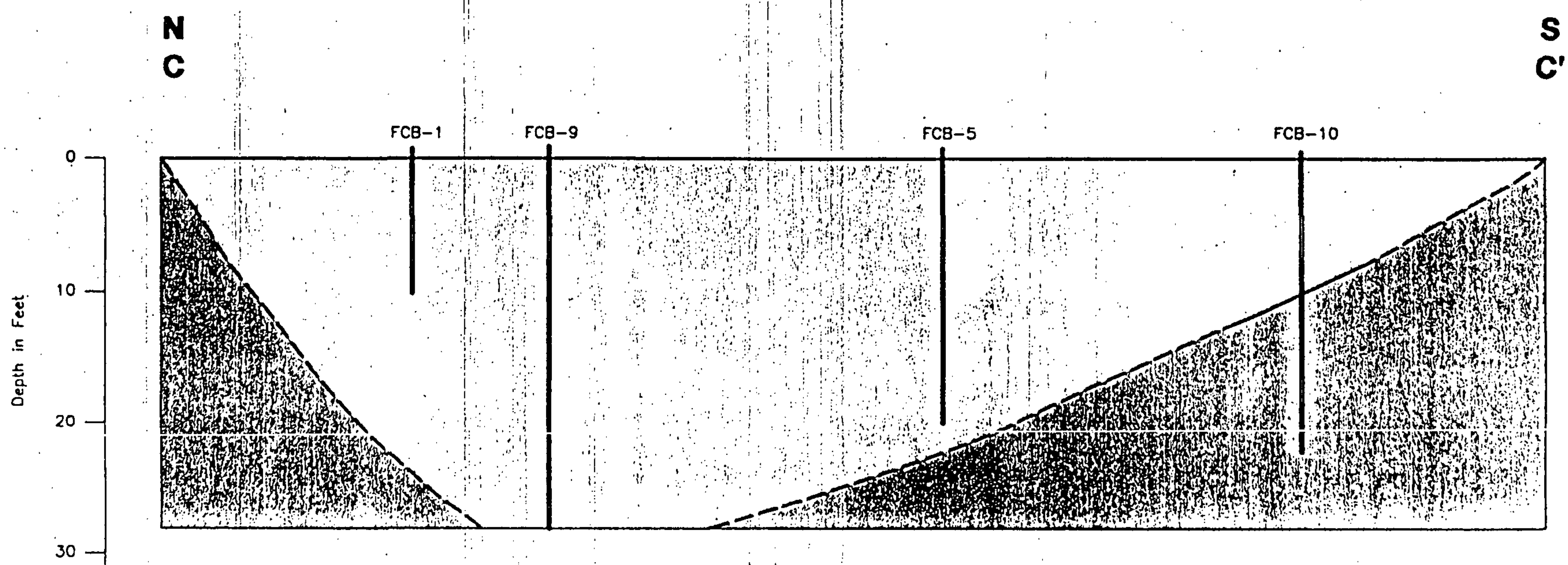
Note:
Boring Locations are Projected onto Line of Cross Section from Distances up to 40' Away.

ERM

22323.00.01/08.11.99-CMP/E104-2A

ERM

Cross Section C-C'
Givaudan-Roure Corporation
Clifton, New Jersey



Vertical Exaggeration = 6x

60 30 0 60

Scale in Feet

Note:
Boring Locations are Projected onto Line of Cross Section from Distances up to 20 Feet Away.

Fill Material
(Sand,Silt,Clay,Gravel and Assorted Debris)

Native Soil
(Sand,Silt, or Sand and Silt)

Lithological Contact Between Fill Material and Native Soil (Dashed where Inferred)

22323.00.01/08.11.99-CMP/E105-2A

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Appendix B-3
Sampling Results

Summary of Sample Locations

Investigation Area	Sample ID	Sample Depth (feet)	Date Collected	Medium
Storm Water Discharge	DP(6-12")	0.5-1	9/30/98	Soil
Storm Water Discharge	DP(12-18")	1-1.5	9/30/98	Soil
Former Brine Chiller	PAR-6(3.5-4')	3.5-4	8/14/98	Soil
Former Brine Chiller	PAR-6(6-12")	0.5-1	8/14/98	Soil
Former Brine Chiller	PAR-7(3.5-4')	3.5-4	8/14/98	Soil
Former Brine Chiller	PAR-7(6-12")	0.5-1	8/14/98	Soil
Former Brine Chiller	PAR-8(3.5-4')	3.5-4	8/14/98	Soil
Former Brine Chiller	PAR-8(3.5-4')	3.5-4	8/25/98	Soil
Former Brine Chiller	PAR-8(6-12")	0.5-1	8/14/98	Soil
Former Alcohol Tank	PAR-9(3.5-4')	3.5-4	8/17/98	Soil
Former Alcohol Tank	PAR-9(6-12")	0.5-1	8/17/98	Soil
Former Brine Chiller	PAR-10(3.5-4')	3.5-4	8/17/98	Soil
Former Brine Chiller	PAR-10(3.5-4')	3.5-4	8/25/98	Soil
Former Brine Chiller	PAR-10(6-12")	0.5-1	8/17/98	Soil
Former Railroad Tracks	PAR-11(3.5-4')	3.5-4	8/17/98	Soil
Former Railroad Tracks	PAR-11(6-12")	0.5-1	8/17/98	Soil
Former Railroad Tracks	PAR-12(3.5-4')	3.5-4	8/17/98	Soil
Former Railroad Tracks	PAR-12(6-12")	0.5-1	8/17/98	Soil
Former Railroad Tracks	PAR-14(3-3.5')	3.5-4	8/25/98	Soil
Former Railroad Tracks	PAR-14(3.5-4')	3.5-4	8/17/98	Soil
Former Railroad Tracks	PAR-14(3.5-4')	3.5-4	8/25/98	Soil
Former Railroad Tracks	PAR-14(6-12")	0.5-1	8/17/98	Soil
Former Railroad Tracks	PAR-15(3.5-4')	3.5-4	8/17/98	Soil
Former Railroad Tracks	PAR-15(6-12")	0.5-1	8/17/98	Soil
Former Railroad Tracks	SSW-A	3-3.5	12/17/98	Soil
Former Railroad Tracks	SSW-B	4-4.5	12/17/98	Soil
Former Railroad Tracks	SF-1	9.5-10	12/17/98	Soil

1: TCL VOCs
2: TCL SVOCs
3: TAL Metals
4: TCL PCBs
5: TCL Pesticides

Investigation Area	Sample ID	Sample Depth (feet)	Date Collected	Medium
Former Railroad Tracks	MSW-B	8-8.5	12/17/98	Soil
Former Railroad Tracks	MSW-A	7.5-8	12/17/98	Soil
Former Railroad Tracks	NSW-A	3.5-4	12/17/98	Soil
Former Railroad Tracks	NSW-B	5-5.5	12/17/98	Soil
Former Railroad Tracks	NSW-BD	5-5.5	12/17/98	Soil
Former Railroad Tracks	NF-1	5-5.5	12/17/98	Soil
Former Railroad Tracks	WSW-A	2.5-3	12/17/98	Soil
Former Railroad Tracks	WSW-B	3-3.5	12/17/98	Soil
Former Railroad Tracks	ESW-A	3.5-4	12/17/98	Soil
Former Railroad Tracks	ESW-B	4-4.5	12/17/98	Soil
Former Railroad Tracks	MSW-A-2	7.5-8	2/16/99	Soil
Vacant Land	FCB-1(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-1(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-1(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-2(0.5-1')	0.5-1	4/22/99	Soil
Vacant Land	FCB-2(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-2(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-2(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-3(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-3(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-3(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-4(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-4(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-4(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-5(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-5(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-5(8-10')	8-10	5/4/98	Soil

1 TCL VOCs
2 TCL SVOCs
3 TAL Metals
4 TCL PCBs
5 TCL Pesticides

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Investigation Area	Sample ID	Sample Depth (feet)	Date Collected	Medium
Vacant Land	FCB-6(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-6(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-6(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-7(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-7(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-7(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-8(0.5-1')	0.5-1	4/22/99	Soil
Vacant Land	FCB-8(0-2')	0-2	5/4/98	Soil
Vacant Land	FCB-8(4-6')	4-6	5/4/98	Soil
Vacant Land	FCB-8(8-10')	8-10	5/4/98	Soil
Vacant Land	FCB-9(0-2')	0-2	5/14/98	Soil
Vacant Land	FCB-9(4-6')	4-6	5/14/98	Soil
Vacant Land	FCB-9(8-10')	8-10	5/14/98	Soil
Vacant Land	FCB-10(0-2')	0-2	5/14/98	Soil
Vacant Land	FCB-10(4-6')	4-6	5/14/98	Soil
Vacant Land	FCB-10(8-10')	8-10	5/14/98	Soil
Vacant Land	FCHB-1	0.5-1	5/4/98	Soil
Vacant Land	FCHB-2	0.5-1	5/14/98	Soil

1: TCL VOCs
2: TCL SVOCs
3: TAL Metals
4: TCL PCBs
5: TCL Pesticides

--U161PG235

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eding NJDEP Soil Cleanup Criteria Within the Affected Area
Givaudan Roure Corporation
Clifton, New Jersey

Medium	Constituents	RDCSCC (mg/Kg)	IGWSCC (mg/Kg)	Concentration (mg/Kg)
	SVOCs			
Soil	Benzo(a)anthracene	0.9	500	2.1 *(J)*
Soil	Benzo(b)fluoranthene	0.9	50	2.1 *(J)*
Soil	Benzo(k)fluoranthene	0.9	500	2.2 *(J)*
Soil	Benzo(a)pyrene	0.66	100	2.4 *(J)*
Soil	Indeno(1,2,3-cd)pyrene	0.9	500	1.6 *(J)*
	SVOCs			
Soil	Benzo(a)anthracene	0.9	500	1.6
Soil	Benzo(b)fluoranthene	0.9	50	1.9
Soil	Benzo(k)fluoranthene	0.9	500	1.3
Soil	Benzo(a)pyrene	0.66	100	1.8
Soil	Indeno(1,2,3-cd)pyrene	0.9	500	1.2
	SVOCs			
Soil	Benzo(a)anthracene	0.9	500	2.4
Soil	Benzo(b)fluoranthene	0.9	50	2.4
Soil	Benzo(k)fluoranthene	0.9	500	1.6
Soil	Benzo(a)pyrene	0.66	100	2.2
Soil	Indeno(1,2,3-cd)pyrene	0.9	500	1.7
	SVOCs			
Soil	Benzo(a)anthracene	0.9	500	3.6
Soil	Benzo(b)fluoranthene	0.9	50	3.2
Soil	Benzo(k)fluoranthene	0.9	500	2.7
Soil	Benzo(a)pyrene	0.66	100	3
	Indeno(1,2,3-cd)pyrene	0.9	500	1.7
	SVOCs			
	Benzo(b)fluoranthene	0.9	50	1.7
	Benzo(a)pyrene	0.66	100	0.77
	SVOCs			
	Benzo(a)anthracene	0.9	500	1.4
	Benzo(b)fluoranthene	0.9	50	1.0
	Benzo(k)fluoranthene	0.9	500	0.82
	Benzo(a)pyrene	0.66	100	1.2
	Indeno(1,2,3-cd)pyrene	0.9	500	0.91

nd in method blank.
CRQL but greater than zero.

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Samples Exceeding NJDEP Soil Cleanup Criteria Within the Affected Area
Givaudan Roure Corporation
Clifton, New Jersey

Sample ID	Constituents	RDCSCC (mg/Kg)	IGWSCC (mg/Kg)	Concentration (mg/Kg)
FCB-2 (0.5-1')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	1.1
	Benzo(b)fluoranthene	0.9	50	1.1
	Benzo(k)fluoranthene	0.9	500	1.0
	Benzo(a)pyrene	0.66	100	1.1
FCB-2 (4-6')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	3.7
	Benzo(b)fluoranthene	0.9	50	5.1 *(D)*
	Benzo(k)fluoranthene	0.9	500	1.2
	Benzo(a)pyrene	0.66	100	3.5
	Indeno(1,2,3-cd)pyrene	0.9	500	2.9
FCB-2 (8-10')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	13 *(D)*
	Crysene	9	500	9.6 *(D)*
	Benzo(b)fluoranthene	0.9	50	13 *(D)*
	Benzo(k)fluoranthene	0.9	500	7 *(D)*
	Benzo(a)pyrene	0.66	100	11 *(D)*
	Indeno(1,2,3-cd)pyrene	0.9	500	4.2
FCB-3 (4-6')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	3.5
	Benzo(b)fluoranthene	0.9	50	3.8
	Benzo(k)fluoranthene	0.9	500	1.5
	Benzo(a)pyrene	0.66	100	3.3
	Indeno(1,2,3-cd)pyrene	0.9	500	27.0
FCB-4 (0-2')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	1.5
	Benzo(b)fluoranthene	0.9	50	1.3
	Benzo(a)pyrene	0.66	100	1.3
FCB-5 (4-6')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	1.8
	Benzo(b)fluoranthene	0.9	50	1.5
	Benzo(k)fluoranthene	0.9	500	1.0
	Benzo(a)pyrene	0.66	100	1.7
	Indeno(1,2,3-cd)pyrene	0.9	500	1.2

Qualifiers:
B: Constituent was also found in method blank.
J: Constituent is less than CRQL but greater than zero.

Samples Exceeding NJDEP Soil Cleanup Criteria Within the Affected Area
Givaudan Roure Corporation
Clifton, New Jersey

Sample ID	Constituents	RDCSCC (mg/Kg)	IGWSCC (mg/Kg)	Concentration (mg/Kg)
FCB-9 (0-2')	*SVOCs*			
	Fluoranthene	2300	100	120 *(D)*
	Benzo(a)anthracene	0.9	500	60
	Crysene	9	500	55
	Benzo(b)fluoranthene	0.9	50	56 *(D)*
	Benzo(k)fluoranthene	0.9	500	30
	Benzo(a)pyrene	0.66	100	61 *(D)*
	Indeno(1,2,3-cd)pyrene	0.9	500	45 *(D)*
	Dibenzo(a,h)anthracene	0.66	100	14
FCB-9 (8-10')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	3.1
	Benzo(b)fluoranthene	0.9	50	2.6
	Benzo(k)fluoranthene	0.9	500	1.7
	Benzo(a)pyrene	0.66	100	2.8
FCB-10 (0-2')	*SVOCs*			
	Benzo(a)anthracene	0.9	500	1.3
	Benzo(b)fluoranthene	0.9	50	1.0
	Benzo(k)fluoranthene	0.9	500	1.1
	Benzo(a)pyrene	0.66	100	1.3
FCB-10 (4-6')	*VOCs*			
	Tetrachloroethene	4	1	2.5
	SVOCs			
	Benzo(a)anthracene	0.9	500	1.7
	Benzo(b)fluoranthene	0.9	50	1.5
	Benzo(k)fluoranthene	0.9	500	0.95
	Benzo(a)pyrene	0.66	100	1.5
FCB-10 (8-10')	*VOCs*			
	Tetrachloroethene	4	1	2.1
	SVOCs			
	Benzo(a)anthracene	0.9	500	5.9
	Benzo(b)fluoranthene	0.9	50	6.4
	Benzo(k)fluoranthene	0.9	500	5.2
	Benzo(a)pyrene	0.66	100	6.4
FCHB-2	*VOCs*			

Qualifiers:
B: Constituent was also found in method blank.
J: Constituent is less than CRQL but greater than zero.

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Samples Exceeding NJDEP Soil Cleanup Criteria Within the Affected Area
Givaudan Roure Corporation
Clifton, New Jersey

Sample ID	Constituents	RDCSCC (mg/Kg)	IGWSCC (mg/Kg)	Concentration (mg/Kg)
	Tetrachloroethene	4	**1**	1.4
SSW-A	SVOCs			
	Benzo(a)anthracene	**0.9**	500	3.5
	Benzo(b)fluoranthene	**0.9**	50	2.7
	Benzo(k)fluoranthene	**0.9**	500	3.3
	Benzo(a)pyrene	**0.66**	100	2.5
MSW-A	SVOCs			
	Benzo(a)anthracene	**0.9**	500	13
	Chrysene	**9**	500	12
	Benzo(b)fluoranthene	**0.9**	50	15
	Benzo(k)fluoranthene	**0.9**	500	8.2
	Benzo(a)pyrene	**0.66**	100	15
	Indeno(1,2,3-cd)pyrene	**0.9**	500	7.3
	Dibenz(a,h)anthracene	**0.66**	100	3 J
NF-1	SVOCs			
	Benzo(a)anthracene	**0.9**	500	1.2
	Benzo(k)fluoranthene	**0.9**	500	1
	Benzo(a)pyrene	**0.66**	100	1.1
WSW-A	SVOCs			
	Benzo(a)anthracene	**0.9**	500	7
	Benzo(b)fluoranthene	**0.9**	50	5.8
	Benzo(k)fluoranthene	**0.9**	500	5.1
	Benzo(a)pyrene	**0.66**	100	6.1
	Indeno(1,2,3-cd)pyrene	**0.9**	500	2.5
ESW-A	SVOCs			
	Benzo(a)pyrene	**0.66**	100	0.86

Note: Constituents shown exceed the more stringent of the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) and Impact to Groundwater Soil Cleanup Criteria (IGWSCC).
The Soil Cleanup Criteria which is exceeded is shown in **boldface**.

Qualifiers:
B: Constituent was also found in method blank.
J: Constituent is less than CRQL but greater than zero.

Figure 2-1
Excavated Area Along Railroad Tracks
Givaudan-Roure Corporation
Clifton, New Jersey

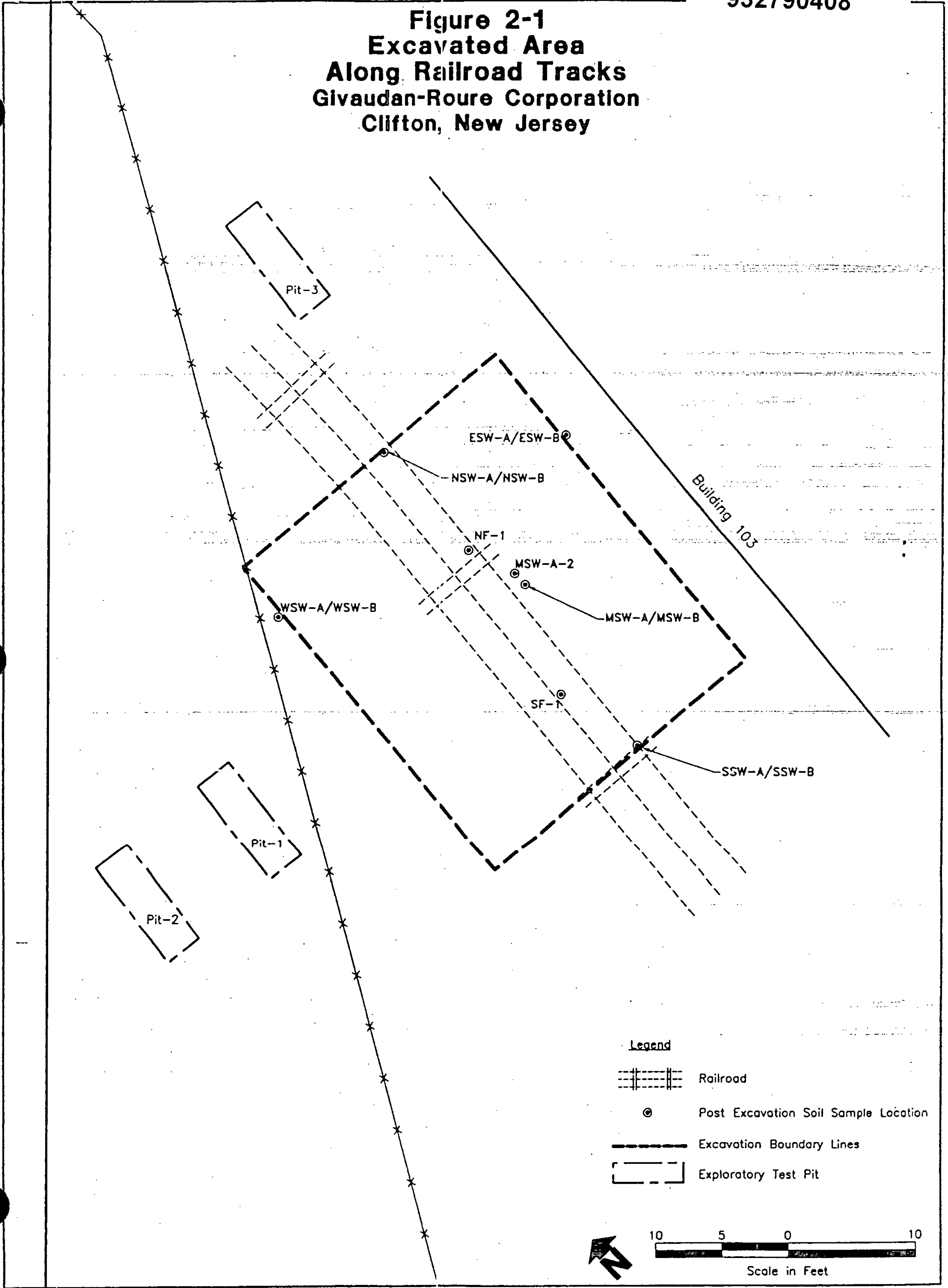

EXHIBIT C – DESCRIPTION OF INSTITUTIONAL AND ENGINEERING CONTROLS AND MONITORING AND MAINTENANCE PLAN

INSTITUTIONAL AND ENGINEERING CONTROL

The institutional control in the area addressed by the Deed Notice is that the Affected Area shall not be used for residential purposes and intrusive activities can not be started until the Department is contacted and informed in writing of the specific actions and planned end results of the intrusive work as spelled out in Section 3 of the Deed Notice. Residential land use restriction is a requirement of Paragraph 1 of the Deed Notice.

The Engineering Control in place for the Affected Area consists of the existing building (103), asphalt pavement, vegetative cover and a perimeter security system consisting of a 10 feet high, barbed wire chain-link-fence and locking gates. These controls minimize the likelihood of migration of the contaminants and unacceptable risk of exposure to humans or the environment, and unauthorized access to the Affected Area. Engineering controls will be maintained as set forth below.

MONITORING AND MAINTENANCE PLAN

The Monitoring and Maintenance Plan describes the monitoring and maintenance activites for the engineering controls. The following program of routine inspections has been prepared to disclose conditions that might compromise the protective function of the vegetative cover, asphalt pavement, and perimeter security fence and to facilitate preventative maintenance.

A property management specialist representing the owner will annually inspect the building, asphalt pavement, vegetative cover, and perimeter security system. The vegetative cover will be inspected to assess whether the existing cover has been compromised by erosion, traffic, or other means resulting in exposure to underlying soils. The surface of the asphalt pavement within the affected area will be evaluated for cracking, pitting, evidence of underrnining (subsidence), heaving, or any other action that may serve to compromise the integrity of the asphalt pavement. The perimeter security system will be evaluated to verify that the fence is in good condition, has no visible unauthorized access points or other breaches, will continue to limit site access, and that the gate are locked and the locks are in working condition. Within 30 days of the date of inspection, a letter will be provided to the NJDEP that presents the results of this inspection, what damage was noted, what repairs were or will be taken, and the schedule of future repair work.

Additionally, the perimeter security system will be monitored by the security personnel on a weekly basis as part of their routine inspection. The locked access gates will be checked daily as part of the security patrol.

If evidence of breaches or other unacceptable compromises in the integrity of the vegetative cover or asphalt pavement are detected, work necessary to restore the integrity of these engineering controls shall be initiated and performed (weather permitting and to the extent technically feasible) within 60 days after discovery of the need for such work. Repairs to the perimeter security system will be made as soon as practical after discovery. Repairs shall be performed in accordance with NJDOT's Standard Specifications for Road and Bridge Construction to restore the integrity and functionality of the vegetative cover, asphalt pavement, and/or perimeter security system.

ENGINEER'S CERTIFICATION

Based on my professional opinion, I hereby certify that the vegetative cover, asphalt pavement, and perimeter security system, maintained in accordance with this monitoring and maintenance plan, will mitigate the likelihood of direct contact with the soils within the Affected Area.

Carl E Petrus

Carl Petrus, P.E.
NJ 16404

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Appendix D-1
Diagram of As-Built Engineering Controls (See Exhibit B-1)

Exhibit D-2
United States Geologic Survey
Quadrangle Map Depicting Site
Location

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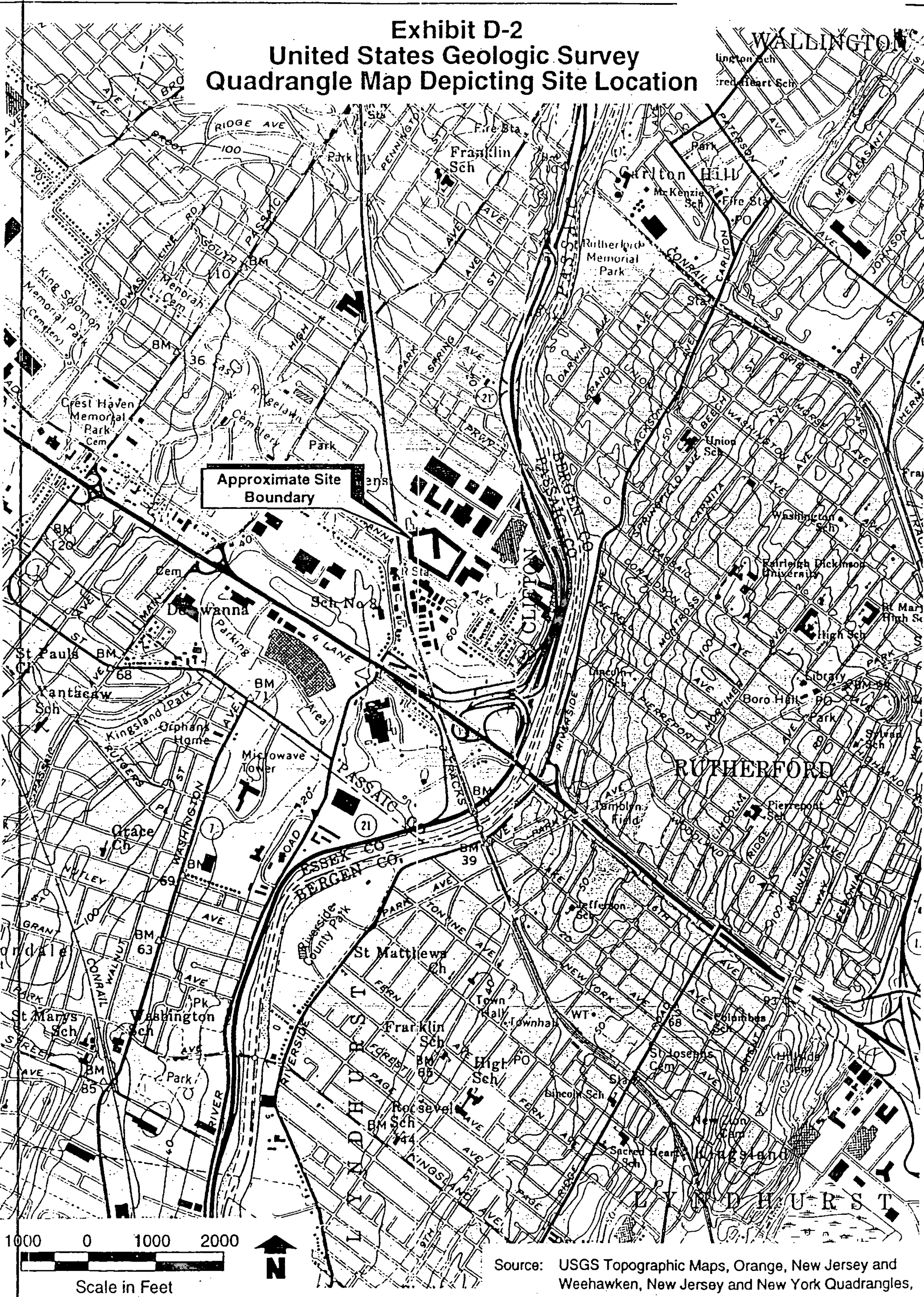
Exhibit D-2
United States Geologic Survey Quadrangle Map Depicting Site Location



Source: USGS Topographic Maps, Orange, New Jersey and Weehawken, New Jersey and New York Quadrangles,

Exhibit D-3
Hangstrom County Map
Depicting Site Location

--U161PG246

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Exhibit D-3
Hagstrom County Map Depicting Site Location

Source: Hagstrom Map, Passaic County, New Jersey

ERM

22323.00.01 AP/JH 6-11-99

--U161PG247 932790415

Exhibit D-4
Site Map Portraying Surface Topological Features and As-Built Engineering Controls
(See Exhibit B-1)

STATE OF NEW JERSEY)
) ss.:
COUNTY OF MORRIS)

I CERTIFY as follows:

1. On June 14, 1999, David Johnson personally appeared before me;

2. I was satisfied that this person is the person who executed the attached instrument as the Vice President-Environmental Health & Safety of Givaudan Roure Corporation, the corporation named in the attached document; and

3. This person stated that he was authorized to execute the instrument on behalf of Givaudan Roure Corporation and that he executed the instrument as the act of such corporation.

Signed and sworn before me on
June 14, 1999

Jamie Smith
(Notary)

JAMIE SMITH
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES DEC. 3, 1999

"END OF DOCUMENT"

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--1116 1PG 249

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RECEIVED
MAY 23 2001

David B. Johnson
Senior Vice President
General Manager

BBF000096

Givaudan

May 16, 2001

Mr. Robert C. Shinn, Jr., Commissioner
New Jersey Department of Environmental Protection
401 E. State Street
7th Floor, East Wing
PO Box 402
Trenton, NJ 08625-0402

Dear Commissioner Shinn,

In the 1980's the Givaudan Corporation began to evaluate potential site contamination at its Clifton, NJ plant. By the end of the decade, the New Jersey Department of Environmental Protection and Givaudan were working together to address site soil and groundwater conditions. In the 1990's underground storage tanks were removed, contaminated soil was consolidated on-site, and groundwater conditions were extensively sampled and characterized.

In 1998 Givaudan made the difficult business decision to discontinue manufacturing of specialty chemicals at Clifton. This resulted in the closure, demolition of the former plant buildings and divestment of the property. Givaudan made a strong corporate commitment to responsively remediate the site, so that productive utilization of the property could occur in a timely manner. Givaudan together with our consultant, Environmental Resources Management, began a significant period of soil sampling, in concurrence with the technical regulations, and significant removal of soil sources of groundwater contamination. Although the majority of this work was conducted "at risk", the NJDEP and our Case Manager, Maria Franco-Spera and her team, provided management and direction for this vast endeavor which was accomplished in a short time period.

In 1999 Givaudan sold its property on the north side of Delawanna Avenue to Morris Clifton Associates, and this has resulted in the construction of a new industrial warehouse (approximately 200,000 sq. ft.), active reuse of two smaller industrial buildings, and the renovation of the former Givaudan office building. This past month we completed the sale of the former chemical plant property on the south side of Delawanna Avenue to Morris Clifton Associates, enabling this property to be put back into productive use. Two large industrial warehouse/manufacturing buildings (in excess of 400,000 sq. ft. for one and ~200,000 sq. ft for the other) are presently being constructed on this site. This productive redevelopment effort represents a significant win for the City of Clifton and the State of New Jersey, as well as for all of the people who are, and will be, employed at this former "Brownfields" site.

On behalf of Givaudan Fragrances Corporation, I want to express to you our appreciation for the professionalism, technical competence and cooperation that Maria Franco-Spera and her technical support team has exhibited throughout this process. Without her support and hard work this project could not have been accomplished in the timely and innovative way that it has been. The results speak for themselves. A difficult property has been remediated to the point where it can safely be placed back into productive use. We at Givaudan salute the New Jersey Department of Environmental Protection for helping us complete this huge project in two years (plant shutdown mid-1998 to soil approval in mid-2000) and provide the framework with Morris Clifton, the developer, to provide for new jobs for Clifton and New Jersey.

Sincerely,

David B. Johnson

DBJ/mbm

(DBJ-NJDEP-southclose-Maria Franco-Spera.doc)

Cc: Maria Franco-Spera - NJDEP
Christopher J. Kanakis – NJDEP
Dr. Christian Salomon – Givaudan
Eugene Thomas – Givaudan

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Environmental
Resources
Management

855 Springdale Drive
Exton, Pennsylvania 19341
(610) 524-3500
(610) 524-7335 (fax)
http://www.erm.com

4 June 2002
Reference: 22321.10.01

JUN 0 5 2002

Ms. Maria Franco-Spera
Bureau of State Case Management
New Jersey Department of
Environmental Protection
401 East State Street, CN048
Trenton, New Jersey 08625

RE: Givaudan Fragrances Corporation
275 River Road, Clifton, New Jersey 07014
Block 73.03, Lot 2.02
Biennial Certification – 2,3,7,8-TCDD Cell

BBF000100

Dear Ms. Franco-Spera,

On behalf of our client, Givaudan Fragrances Corporation (Givaudan), Environmental Resources Management, Inc. (ERM) is submitting three copies of the above referenced document to the New Jersey Department of Environmental Protection (Department). This document is being submitted to fulfill the reporting requirement noted in Exhibit C of the Deed Notice for this property. As we previously discussed, the submittal of this document was postponed pending the completion of the corrective action that was recommended based on the 17 April 2002 semi-annual inspection of the 2,3,7,8-tetrachlorodibenzo-p-dioxin containment cell (2,3,7,8-TCDD Cell). The recommended corrective action included seal-coating the entire asphalt cap. This activity was completed on 21 May 2002, after it had been delayed multiple times due to forecasted precipitation.

To satisfy the certification requirements noted in Section IV of the Biennial Certification Form, John Vernieri of Givaudan has signed the form in the designated location. His signing authority is verified by the attached Certifications, which have been signed and sealed by the Assistant Secretary of Givaudan, E. Lucey Blum.

If you have any questions related to this submittal, please contact Rick Wroblewski or myself at (610) 524-3500.

Sincerely,

John B. Hogue

John B. Hogue,
ERM Project Geologist

enclosure: As Noted Above
cc: Rick Wroblewski, *ERM*
Tim Gromen, *Givaudan*

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BBF000101

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection

Bureau of Case Management
P.O. Box 028
401 East State Street
Trenton, NJ 08625-0028

Bradley M. Campbell
Commissioner

VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED
NO. 7000 1670 0013 7837 5607

MAR 12 2002

Mr. John Vernieri
Vice President, Fragrance Operations, Mt. Olive
Givaudan Fragrances Corporation
International Trade Center
300 Waterloo Valley Road
Mt. Olive, NJ 07828

Re: **Entire Site Restricted Use No Further Action Letter for Soils Only and Covenant Not to Sue**
Givaudan Fragrances Corporation, Block 73.03, Lot 2.02
125 Delawanna Avenue, City of Clifton, Passaic County
Administrative Consent Order Dated: March 5, 1987 and Amended on February 16, 1988
KCSL # NJD002156354

Dear Mr. Vernieri:

Pursuant to N.J.S.A. 58:10B-13.1 and N.J.A.C. 7:26C, the New Jersey Department of Environmental Protection ("Department") makes a determination that no further action is necessary for the remediation of the site as specifically referenced above, except as noted below, so long as Givaudan Fragrances Corporation ("Givaudan") did not withhold any information from the Department. This action is based upon information in the Department's case file and Givaudan's final certified Remedial Action Report dated October 8, 1999. In issuing this No Further Action Determination and Covenant Not to Sue, the Department has relied upon the certified representations and information provided to the Department.

By issuance of this No Further Action Determination, the Department acknowledges the completion of a Site Investigation, Remedial Investigation and Remedial Action pursuant to the Technical Requirements for Site Remediation (N.J.A.C. 7:26E) for the entire site.

NO FURTHER ACTION CONDITIONS

As a condition of this No Further Action Determination Givaudan as well as each subsequent owner, lessee and operator (collectively "Successors") shall comply with each of the following:

Name and Address Changes

Pursuant to N.J.S.A. 58:10B-12, Givaudan and the Successors shall inform the Department in writing whenever its name or address changes, within 14 calendar days after the change.

Deed Notice

Pursuant to N.J.S.A. 58:10B-13a, Givaudan and the Successors shall ensure that the Deed Notice filed on April 19, 2000 with the Office of the Passaic County Register is complied with including maintenance of applicable engineering controls. The deed notice can be found in Deed Book 166, Page 1.

Pursuant to N.J.S.A 58:10B-13h, an owner of a property on which a Deed Notice has been recorded shall notify any person who intends to excavate on the site of the nature and location of any contamination existing on the site and of any conditions or measures necessary to prevent exposure to contaminants.

Monitoring of Compliance

Pursuant to N.J.S.A. 58:10B-13.1, Givaudan and the Successors shall conduct semi-annual monitoring for compliance and effectiveness of the institutional and engineering control(s) specified in this document and submit a written certification to the Department every two years that the institutional and engineering control(s) are being properly maintained and continue to be protective of public health and safety and the environment. Any such certification shall include the information relied upon to determine that no changes have occurred.

COVENANT NOT TO SUE

The Department issues this Covenant Not to Sue pursuant to N.J.S.A. 58:10B-13.1. That statute requires a covenant not to sue with each no further action letter. However, in accordance with N.J.S.A. 58:10B-13.1, nothing in this Covenant shall benefit any person who is liable, pursuant to the Spill Compensation and Control Act (Spill Act), N.J.S.A. 58:10-23.11, for cleanup and removal costs and the Department makes no representation by the issuance of this Covenant, either express or implied, as to the Spill Act liability of any person.

The Department covenants, except as provided in the preceding paragraph, that it will not bring any civil action against the following:

(a) the person who undertook the remediation;
(b) subsequent owners of the subject property;
(c) subsequent lessees of the subject property; and
(d) subsequent operators at the subject property,

for the purposes of requiring remediation to address contamination which existed prior to the date of the final certified report for the real property at the site identified above, or payment of cleanup and removal costs for such additional remediation.

The person who undertook the remedial action, and each subsequent owner, lessee and operator, during that person's ownership, tenancy or operation, shall maintain those controls and conduct periodic compliance monitoring in the manner the Department requires.

Any person who may benefit from this Covenant is barred from making a claim against the Spill Compensation Fund, N.J.S.A. 58:10-23.11i, and the Sanitary Landfill Facility Contingency Fund, N.J.S.A. 13:1E-105, for any costs or damages relating to the remediation covered by this Covenant. All other claims against these funds will be controlled by the corresponding statutes and their implementing regulations.

Any person who may benefit from this Covenant is barred from making a claim against the Spill Compensation Fund, N.J.S.A. 58:10-23.11i, and the Sanitary Landfill Facility Contingency Fund, N.J.S.A. 13:1E-105, for any costs or damages relating to the remediation covered by this Covenant if the Department requires additional remediation in order to remove the institutional control. All other claims against these funds will be controlled by the corresponding statutes and their implementing regulations.

Pursuant to N.J.S.A. 58:10B-13.1d, this Covenant does not relieve any person from the obligation to comply in the future with laws and regulations. The Department reserves its right to take all appropriate enforcement for any failure to do so.

The Department may revoke this Covenant at any time after providing notice upon its determination that either:

(a) any person with the legal obligation to comply with any condition in this No Further Action Letter has failed to do so; or
(b) any person with the legal obligation to maintain or monitor any engineering or institutional control has failed to do so.

This Covenant Not to Sue, which the Department has executed in duplicate, shall take effect immediately once the person who undertook the remediation has signed and dated the Covenant Not to Sue in the lines supplied below and the Department has received one copy of this document with original signatures of the Department and the person who undertook the remediation.

GIVAUDAN FRAGRANCES CORPORATION

Name: Mr. John Vernieri
Fragrance Operations, Mt. Olive

Signature: John A Vern

Title: Vice President

Dated: 4/12/02

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Name: Mr. Bruce Venner
Bureau of Case Management

Signature: Bruce Venner

Title: Bureau Chief

Dated: 3/11/02

NOTICES

Off-site Contamination

Please be advised that pollution in the ground water at this site exists above the Ground Water Quality Standards (N.J.A.C. 7:9-6) which may limit ground water use at this site. It has been determined that this contamination is from a source unrelated to this site. This ground water contamination is being addressed under Case # NJD002156354, ISRA Case #97404.

Administrative Consent Order

Please be advised that this notice will serve to release the Remediation Funding Source to Givaudan established for the Administrative Consent Order signed on February 19, 1998 by Givaudan and the Department and any other funds held pending compliance.

Direct Billing Insert

Please be advised that pursuant to the Procedures for Department Oversight of the Remediation of Contaminated Sites (N.J.A.C. 7:26C et. seq.) Givaudan is required to reimburse the Department for oversight of the remediation. The Department will be issuing a bill within the next four months.

Thank you for your attention to these matters. If you have any questions, please contact Maria Franco-Spera, case manager at (609) 633-0715.

Sincerely,

Bruce Venner

Bruce Venner, Bureau Chief
Bureau of Case Management

Cc: Maria Franco-Spera, Case Manager, BCM, NJDEP
Gwen Zervas, Section Manager, BCM, NJDEP
Albert Greco, Health Officer, Clifton Board of Health, 900 Clifton Avenue, NJ 07011
Richard Moran, Municipal Clerk, 900 Clifton Avenue, Clifton, NJ 07011
Pam Lange, Acting Section Chief, BCM, NJDEP
Matt Coefer, Billing and Registration, BFMCR
Daryl Clark, Geologist, BGWPA, NJDEP
Ann Charles, Technical Coordinator, BEERA, NJDEP

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WORK PLAN

BBF000063

Givaudan Roure Corporation

Remedial Action Work Plan For Soils

Clifton, New Jersey

April 2000

22323.00.01

Environmental Resources Management
855 Springdale Drive
Exton, Pennsylvania 19341

Givaudan Roure (Givaudan) has completed extensive investigative and remedial activity at their property located at 125 Delawanna Avenue in Clifton, New Jersey (hereafter referred to as Facility). The investigative work was completed during the plant demolition (August 1998 to December 1999), to comply with both the Industrial Site Recovery Act (ISRA) requirements triggered when the Facility announced its closure in April 1997, and requirements of the Administrative Consent Order dated March 1987. Remedial activity was initiated to comply with a contractual obligation made with a buyer, Reckson-Morris Operating Partnership, LLP (Reckson), to remove the Facility chemical sewer lines.

This remedial activity expanded to include related features that analytical data indicated were likely source areas for chemical compounds detected in ground water. The results of the remedial and investigative activity are that significant source removal has been completed and verified through post excavation sampling, and the soils at the facility are thoroughly investigated through the installation of 885 soil borings over this 33-acre property. This Remedial Action Work Plan for Soils (RAWPS) presents the soil data collected from the investigative work, documents the soil quality remaining in place, and presents the selected remedy (containment) for the soils remaining in place above the applicable New Jersey Department of Environmental Protection (Department) Soil Cleanup Criteria.

Due to the planned sale of the property to Reckson and need to meet an aggressive schedule for preparation of the property for redevelopment, the work completed between 1998 and 1999 was done without formal approval from the Department. However, all work was done in accordance with the New Jersey Technical Regulations for Site Investigation, 1997. Also, the Department was kept informed of work at the Facility through site visits, meetings, conference calls and correspondence. In addition to this report, there are four documents recently submitted to the Department that contain relevant information to support the information and selected remedy presented in this RAWPS. These documents are:

- Planned 2,3,7,8-TCDD Activity (ERM, September 1999) – Soils containing 2,3,7,8,-tetrachlorodibenzo-p dioxin (2,3,7,8-TCDD) were identified around and under building slabs along the southwestern part of the plant. These areas were at locations where 2,3,7,8-TCDD was previously identified and remediated (Remedial Action Report for On-Site Containment of 2,3,7,8,-TCDD Impacted Soil, ERM, October 1999), that could not be accessed when the Facility was active. The

September 1999 ERM letter presents the data obtained during demolition, and the plan for removing and disposing these soils at an approved off-site facility. The Department approved this activity (letter to Givaudan dated 26 October 1999). The work was completed between November and December 1999. The ERM, September 1999 letter and supporting material are included in this RAWPS.

- Preliminary Assessment Report (PAR) (ERM, February 2000) - The PAR is a requirement of ISRA and it documents information about the former manufacturing activities, materials handling, and Areas of Concern (AOCs) identified prior to Facility closure. The investigation of the AOCs, referred to as Miscellaneous Areas, and results are documented in this RAWPS.

- Remedial Action Report (RAR) for Sewer Decommissioning (ERM, February 2000) - The PAR documents the remedial activity completed during demolition which included removal of over 11,000 feet of the chemical sewer and storm sewer lines, the stormwater retention pond, five underground storage tanks, four cesspools, miscellaneous features such as manholes, catch basins, and 15,600 tons of impacted soils removed from the Facility to an approved off-site disposal facility. Post excavation soil sample data, stockpile soil sample data, crushed concrete data, and all manifests are included in the RAR. Plates from the RAR showing the location of exceedences of the Department Soil Cleanup Criteria remaining after the remedial activity are included in an Appendix of this RAWPS.

- Interim Ground Water Report (IGWR) (ERM, February 2000) – The IGWR documents the additional ground water data collected after submitting the Phase III Remedial Investigation Ground Water Report (Phase III RI) in July of 1998. The additional data has not added any new AOCs or changed the understanding of ground water conditions at the Facility. However, the new data has substantially enhanced the understanding of ground water conditions and generally indicate an improvement in ground water quality related to the Facility demolition and remedial activity completed by Givaudan. The summary from the IGWR is included as an appendix in this RAWPS. Givaudan will prepare a separate Remedial Action Selection and Remedial Action Work Plan to document the selected remedy for ground water during calendar year 2000.

Although a substantial amount of additional data has been generated, the focal point of the investigative work remained the four primaries AOCs identified in the Phase III RI:

- Area A – the area surrounding a break in the old chemical sewer line at the northern end of the plant (AOC-A1), and four cesspools removed during the chemical sewer excavation (AOC-A2);

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- Area B - the area around boring B-1 in the vicinity of the suspected sewer break near former Tank 56;
- Area C – the area surrounding the spent acid pit near the stormwater retention pond; and
- Area D – the area in the northwest portion of the plant where toluene was detected in ground water in MW-9S.

The Building Areas and Miscellaneous Areas, identified in the PAR, were added as part of the ISRA requirements.

There were no exceedences of the Departments' Soil Cleanup Criteria identified in soil samples from Area D. The soils remaining in the other AOCs above the Departments' Soil Cleanup Criteria are not believed to present an environmental concern, based on the intended future property use of the Facility as a large distribution warehouse with nearly all of the surface area paved. Horizontal and vertical delineation of the soil exceeding the Residential Direct Contact Soil Cleanup Criteria has been completed except at eleven locations around the perimeter of the property. These areas will be delineated to support definition of a Deed Notice area that will parallel the property line. No exceedences of the Impact to Groundwater Soil Cleanup Criteria (IGWSCC) remain at depths that could provide a continuing source for ground water impacts. The remaining non-delineated exceedences are not considered to be of significant concern for one or more of the following reasons:

- The marginal concentration of the exceedance compared to the applicable Department Soil Cleanup Criteria;
- The lack of occurrence of the chemical of concern in a nearby ground water sample;
- A decreasing concentration trend with depth is apparent;
- The likelihood that the exceedance represents a condition in ground water, but not in unsaturated soil;
- Surrounding soil samples provide evidence that the impacted area is very localized; and
- Generally decreasing concentrations in ground water reported in the IGWR.

It is Givaudan's opinion that no additional investigative work within the Facility is required and sufficient data exists to complete the selection of the preferred remedy. Following selection criteria established in NJAC 7:26E-5, as well as applicable portions of the 6 January 1998 amendments to the Brownfield and Contaminated Site Remediation Act (NJSA 58:10B-1 et. Seq.), and the Industrial Site Recovery Act (NJSA 13:1K-6), containment

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with institutional controls is the preferred remedy. This approach, which will allow redevelopment of the property, will provide jobs and revenue to the local community as quickly as possible, while providing a remedy that is protective of human health and the environment.

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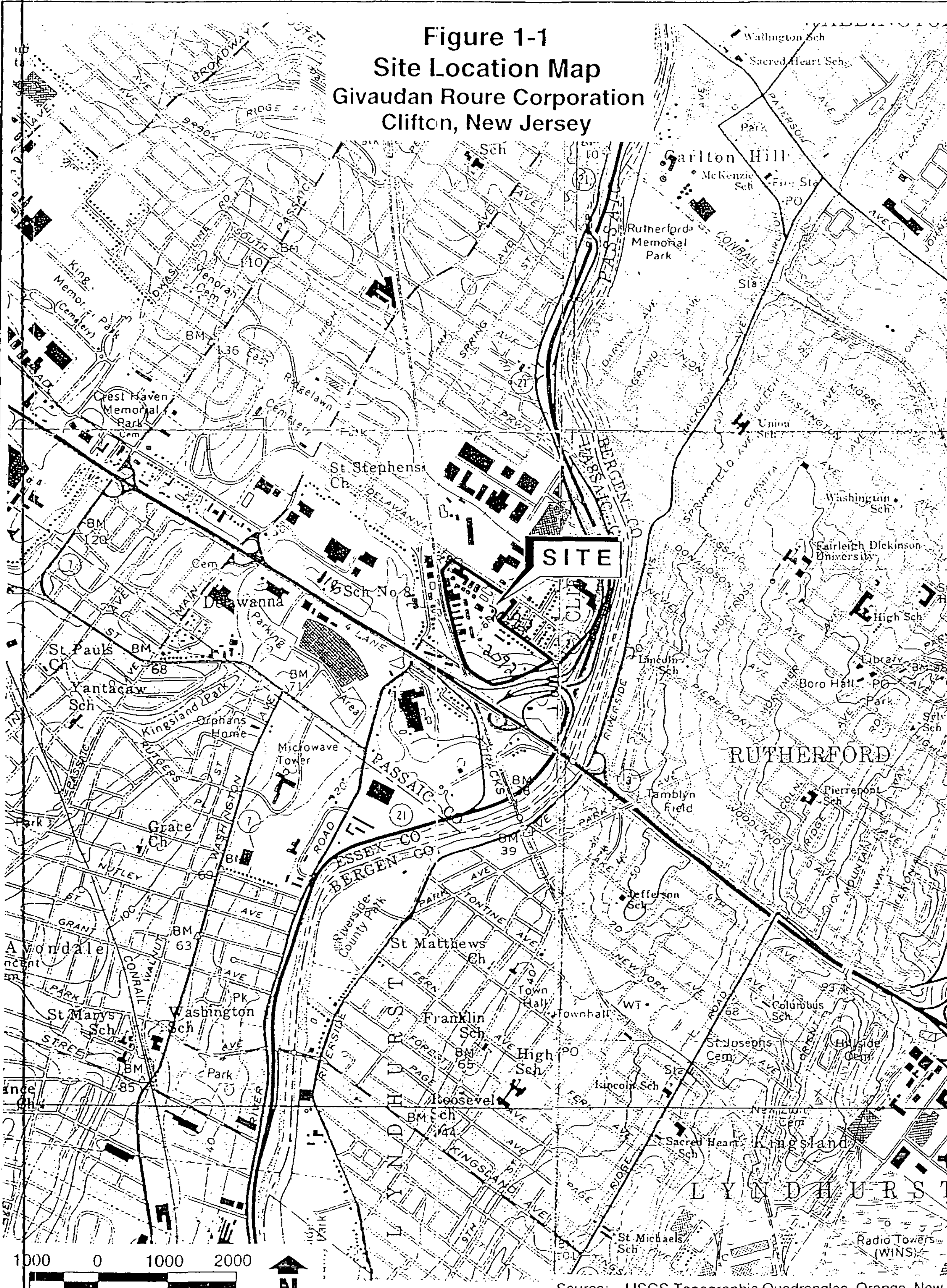
Figure 1-1
Site Location Map
Givaudan Roure Corporation
Clifton, New Jersey



Source: USGS Topographic Quadrangles, Orange, New Jersey; and Weehawken New Jersey-New York.

Table 1-1
Summary of Historical Investigative Reports

ERM. 2000. *Draft Remedial Action Report, 2,3,7,8-TCDD Excavation and Disposal, March, 2000.*

ERM. 2000. *Preliminary Assessment Report, March, 2000.*

ERM. 2000. *Interim Ground Water Report, February, 2000.*

ERM. 2000. *Remedial Action Report for Sewer Decommissioning, February 2000.*

ERM. 1999. *Remedial Action Report for On-Site Contamination of 2,3,7,8-TCDD Impacted Soils, October, 1999.*

ERM. 1999. *Planned 2,3,7,8-TCDD Activity, September, 1999.*

ERM. 1999. *Draft Status Report, June, 1999.*

ERM. 1998. *Phase III Remedial Investigation for Ground Water, July, 1998.*

ERM. 1997. *Remedial Investigation Report for Soils, October, 1997.*

ERM. 1997. *Phase II Remedial Investigation for Ground Water, March, 1997.*

ERM. 1996. *Remedial Action Work Plan for On-Site Containment of 2,3,7,8-TCDD-Impacted Soils, August, 1996.*

ERM. 1996. *Focused Work Plan for Soil Element of Phase II Investigation and Tank Closure Plan, February, 1996.*

ERM. 1994, 1995, 1996 and 1997. *Tank Closure Reports.*

ERM. 1994. *Focused Work Plan, Tank Closures, July, 1994.*

ERM. 1994. *Quality Assurance Project Plan (Revision No. 3), March, 1994.*

ERM. 1991. *Revised Draft Remedial Investigation Report, September, 1991.*

ERM. 1989. *TCDD Investigation Report and Limited Investigation Report, May, 1989.*

1.0 INTRODUCTION

Givaudan Roure Corporation (Givaudan) prepared this Remedial Action Work Plan for Soil (RAWP) for their property (herein referred to as Facility) located at 125 Delawanna Avenue in Clifton, New Jersey (Figure 1-1). This RAWP documents the investigative work completed for soils at the property since 1998, and the proposed remedial action to be implemented for soil. Table 1-1 is a list of all other reports prepared for the Facility that may also be referred to for information of past investigative activity. Sample locations from the prior investigations where exceedences remain above applicable New Jersey Department of Environmental Protection (Department) soil criteria are referenced in this report. Plate 1 shows the sample locations, monitoring wells, and boundaries of the Areas of Concern at the Facility.

The purpose of this RAWP is to:

- Summarize the recent investigative work;
- Identify exceedences of the Department soil criteria remaining; and
- Identify the remedial action selected to address the exceedences of the Department's Soil Cleanup Criteria remaining in soil identified through the investigations completed at the Facility.
- Provide sufficient information to support the proposed remedial action presented in Section 6 of this document.

Most of the original Facility was owned by Antoine Chris before its purchase by Givaudan Corporation, predecessor to Givaudan, in 1913. Two parcels along the southwest side of the Antoine Chris property were purchased in 1926 and 1931 resulting in the current Facility property of approximately 33 acres. Givaudan manufactured a variety of aroma chemicals since operating the Facility.

Givaudan discontinued operations at the Facility in July 1998. From August 1998 through December 1999 Givaudan completed extensive investigative work at the Facility; at the same time they completed significant remedial activity including the removal of chemical and storm sewers and related features such as manholes, cisterns, sumps and the stormwater retention pond. During the removal activities soils were removed where historical sample locations showed exceedences of the Department soil criteria. Plate 2 shows the footprint of excavated and backfilled areas relative to the sample locations and monitoring wells. All above grade structures, buildings, pipe racks, tanks, were demolished between August and November of 1999. The property has been rough graded in preparation for redevelopment. Figure 1-2 shows the Facility prior to demolition.

Under the guidance provided in NJAC 7:26E *Technical Requirements for Site Remediation* (Technical Requirements), a Remedial Investigation Report and Remedial Action Selection Report are generally required to be submitted to the Department for review and approval before implementing a remedial action. Due to scheduling requirements and time constraints related to the divestiture of the Facility, Givaudan elected to proceed with investigative and remediation activities on an "at peril" basis, but in compliance with the Technical Requirements. Therefore Work Plans and Remedial Investigation Reports were not prepared and submitted prior to this RAWP.

Givaudan kept the Department informed of the work as it proceeded through meetings, site visits, various correspondence and phone calls. A report titled *Draft Status Report*, ERM, June 1999, was submitted to the Department. The Draft Status Report summarized a majority of the data discussed in this RAWP, and presented to the Department the intended remedial action for the Facility. This RAWP also contains information that is responsive to the Department's comments on the Draft Status Report, which were submitted to Givaudan on 28 October 1999. Givaudan's response to the Department's comments on the Draft Status Report are provided in Appendix A of this RAWP.

This RAWP presents the soil data and the selected remedial action for soils at the Facility. It also satisfies the requirements of the Administrative Consent Order (ACO) entered into between Givaudan and the Department in 1987, and the Industrial Site Recovery Act (ISRA) requirements triggered by closing the Facility.

1.1 *COMPANION DOCUMENTS*

Four documents recently submitted to the Department, contain information relative to this RAWP for the Facility. Key information from these documents is summarized in this RAWP; however the reader should reference these other documents for specific details. Table 1-1 is a list of all other reports prepared for the Facility that may also be referred to for information of past investigative activity.

+

1.1.1 *Planned 2,3,7,8–TCDD Activity (September 1999)*

note that this dioxin is not here

Soils containing 2,3,7,8-tetrachlorodibenzo-p dioxin (2,3,7,8-TCDD) were identified around and under building slabs in the southwestern part of the Facility during the recent investigative activity. These soils are adjacent to areas where 2,3,7,8-TCDD was previously identified and remediated, but could not be accessed at that time because the Facility was in active production. Extensive sampling was completed to delineate soils containing greater than two (2) parts per billion (ppb) of 2,3,7,8-TCDD. Two parts per billion was the level accepted by the Department as a target cleanup level for soils containing 2,3,7,8-TCDD that would require excavation and removal. The basis for selecting this as the target remediation level is contained in a series of correspondence between the Department and Givaudan, related to when 2,3,7,8-TCDD was first identified and remediated at the Facility from 1988 through 1991. The report entitled *Remedial Action Report for On-Site Containment of 2,3,7,8-TCDD – Impacted Soils* (ERM, October 1999), documents this prior activity. The remediation described in the October 1999 report for the originally identified soil containing 2,3,78,-TCDD involved management of the soil in an engineered containment cell near the southern end of the Facility. Givaudan will retain ownership of this area, which is a separate property and has a Deed Restriction.

The soils containing greater than 2 ppb identified during the 1999 investigation were excavated as described in the September 1999 document and disposed offsite. A copy of the 1999 report, and the conditional approval letter for the planned activity are included in Appendix B. The removal of soil was completed as described in the September 1999 letter during November of 1999. A *Draft Remedial Action Report* for the recently completed activity is also included in Appendix B.

1.1.2 *Preliminary Assessment Report (PAR) (February 2000)*

The PAR, completed to comply with ISRA and contains information about the former manufacturing activities, materials handling, and AOCs identified prior to plant demolition. Figure 1-3 shows the AOCs identified during the PAR that were investigated during 1999. Section 3 of this report identifies the investigations completed to address these AOCs, and the results are discussed in Section 4.

1.1.3 *Remedial Action Report for Sewer Decommissioning (RARSD) (February 2000)*

The RARSD documents the remedial activity completed as part of the plant demolition (1998-1999). Over 11,000 lineal feet of chemical sewer during plant demolition activities completed subsequent to the submittal of the Phase III RI, and to obtain additional data as requested by the Department. The additional data is presented in *the "Interim Ground Water Report"* (IGWR). These new data have not added any new areas of concern or changed the understanding of ground water conditions presented in the Phase III RI. However, they have substantially enhanced the understanding of localized areas of ground water impacts and are providing a basis to evaluate trends in ground water quality data.

The new data includes:

- Analytical results from three additional comprehensive monitoring well sampling events for Target Compound List (TAL); Volatile Organic Compounds (VOCs); Semivolatile Organic Compounds (SVOCs); Target Analyte List (TAL) metals; and Natural Attenuation Parameters (as described in Department guidance);

- Use of low flow sampling to collect samples for total TAL metals analysis to minimize entrainment of suspended solids in the sample;

- Investigative work in Area A, located along the northern property boundary, to determine the extent of free phase, light non-aqueous phase liquid (LNAPL. The LNAPL was first observed in MW-22 and determined to be a Givaudan-specific product comprised of primarily nonhazardous terpenes and ionones, with approximately 6.9% measured as toluene;

- Additional investigative work in Area A to evaluate potential impacts to soil and ground water from four former suspected to be sources for ground water impacts. These cesspools were removed in 1999 as part of the chemical sewer decommissioning;

- Investigative work in Area B, located east of Area A, including the installation of 51 temporary soil borings to further evaluate soil and ground water, and to delineate the presence of a residual phase material (also determined to be a Givaudan-specific product consisting primarily of tert-butyl-toluene) in the northeast portion of Area B;

- Installation and sampling of two off-site wells, MW-33 and MW-45, to delineate the extent of the dissolved phase plumes emanating from Areas A and B respectively;

- Installation and sampling of three wells (MW-32, MW-35, and MW-46) in Area C, located near the center of the Facility, to investigate localized areas where soil data suggests potential impacts to ground water;

- Installation of 16 temporary soil borings along the western property boundary to delineate the extent of, and identify the source area for, toluene-impacted ground water in Area D located along the western property boundary; and

- Installation and sampling of six wells in Area D to characterize the ground water in the suspected source area (MW-36, MW-37, MW-38, MW-39, and MW-40), and to define the extent of off-site migration of toluene-impacted ground water (MW-43).

The completed activities provide a much clearer understanding of the occurrence and migration of impacted ground water beneath the Facility. Combined with the available soil data represented herein, it is evident that few, if any, areas remain in the unsaturated zone that present an environmental concern. This is further supported by generally declining concentrations of Constituents of Concern (COCs) in ground water, as determined from the ground water monitoring completed to date.

A Remedial Action Work Plan for ground water will be submitted in calendar year 2000, which will incorporate all of the IGWR data (along with new data continuing to be collected) in a comprehensive summary of ground water beneath the Facility.

1.2 *DESCRIPTION OF AREAS OF CONCERN*

Plate 1 shows the sample locations, monitoring wells, and the boundaries of the AOCs (A, B, C, D and Building Areas) at the Facility. Plate 2 shows the footprint of excavated and backfilled areas relative to the sample locations and monitoring wells. Plate 3 shows the locations of the Underground Storage Tanks (USTs) closed at the Facility, and the locations of the 2,3,7,8-TCDD delineated and remediated areas described in the *Remedial Action Report for On-Site Containment of 2,3,7,8-TCDD Impacted Soils* (ERM, October 1999).

1.2.1 *Area A*

Area A is approximately 62,700 square feet and covers an area approximately 285 feet in length and 220 feet in width. The longitudinal axis of the area is oriented parallel to Delawanna Avenue (northwest to southeast), offset approximately 140 feet southwest from the center line of Delawanna Avenue (Plate 4).

Area A contained two probable historic contaminant source areas:

1. An exfiltration zone in the "old chemical sewer" (sewer was removed in 1999) which has resulted in impacts to soil and ground water in the north corner of Area A (referred to as AOC-A1); and

2. Four cesspools (removed in late 1998/early 1999) located in the south corner of Area A (referred to as AOC-A2).

The primary constituents of concern in soil and ground water in Area A are toluene and chlorinated VOCs, including: tetrachloroethene (PCE), trichlorethene (TCE), 1,2-dichloroethene (1,2-DCE), 1,2-dichloroethane (1,2-DCA), and vinyl chloride. A free phase LNAPL plume exists on the shallow ground water in this area as well as some residual material in the vadose zone, which is also shown on Plate 4.

1.2.2 *Area B*

Area B is an area of approximately 100,000 square feet bounded to the north by Delawanna Avenue, to the west by Area A and Building 89, to the south by Building 200, and to the east by former Building 72. Area B includes the former production buildings identified as Building 20, 25, and 28 complexes.

The primary constituents of concern in soil and ground water in Area B are VOCs, including acetone, dichloromethane, bromodichloromethene, methylene chloride, carbon tetrachloride, PCE, 1,2-DCA, vinyl chloride and benzene, toluene, ethylbenzene, and xylenes (collectively BTEX). Metals, including copper, arsenic and lead are also considered as constituents of concern in Area B. The following SVOCs, 2,4-dinitrotoluene, dimethylpthalate, fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, benzo(b)fluoranthene, and benzo(a)anthracene are present. A residual phase material, comprised mostly of tert-buytl-toluene, was identified in the northeast portion of Area B. The extent of this area is shown on Plate 5.

1.2.3 *Area C*

Area C is an area of approximately 19,200 square feet, including the Spent Acid Pit (SAP) and Stormwater Retention Pond (Pond). The SAP is roughly rectangular in shape with approximate dimensions of 240 feet x 80 feet. The Pond was in operation for more than 58 years until its closure during 1999. The Pond prior to closure and excavation was approximately 50 feet in diameter and 15 feet in depth.

During operation, the Pond received stormwater from the roof drains, overland flow, and through the aportion of the storm sewer system which discharged to the Pond. Analytical data indicate that the SAP and Pond may be historical source areas for organics and metals detected in the ground water at the Facility. Three different residual materials referred to as C-1, C-2 and C-3 are found in Area C above the shallow water table. A physical description of these materials is provided in Table 4-5, included in Section 4.

1.2.4 *Area D*

Area D encompasses approximately 5,600 square feet and contained a former drum storage area located along the west property boundary. Area D is approximately 140 feet in length and 40 feet in width, with the longitudinal axis oriented parallel to the railroad tracks at the property boundary.

The primary COC in Area D is toluene in ground water. There are no exceedences in the soil in this area above the RDCSCC or the Impact to Ground Water Soil Criteria (IGWSCC).

1.2.5 *Soils Under Building Slabs*

Soils under specific buildings were investigated as part of fulfilling the ISRA requirements. This area, referenced as the "Building Area", occupies the west half of the Facility, where a majority of the former buildings used in production were located. It also includes the other process buildings on the Facility, i.e., former Buildings 7, 9, 25, 89, 50 and 72.

The COCs in the soils under building slabs include one or more VOCs, SVOCs, and metals, and 2,3,7,8-TCDD. The areas containing 2,3,7,8-TCDD at concentrations greater than 2 ppb, at depths up to 12 feet below grade, have been excavated and backfilled.

1.3 *REMEDIAL ACTION WORK PLAN OBJECTIVES*

The objectives of the RAWP are:

1. To present a summary of the analytical data collected during the soil investigation at the Facility;
2. To identify the remaining exceedences of the Department Soil Cleanup Criteria; and
3. To present the preferred remedial alternative for the Facility.

1.4 *REMEDIAL ACTION OBJECTIVES*

In accordance with Section 7:26E-5: Remedial Action Selection of the Technical Requirements, Givaudan has identified the Remedial Action Objectives (RAOs) for soils at the facility.

The RAO's are based on the investigations and potential risks to the public health, welfare, and the environment posed by the soils which will remain in place containing exceedences of the Department's Soil Cleanup Criteria . The RAOs for the Facility are:

- Mitigate potential risks due to direct contact to COCs in soils at concentrations above the Non Residential Direct Contact Soil Cleanup Criteria (NRDCSCC);
- Mitigate potential impact to the ground water from the COCs above the IGWSCC or residual materials in the soil profile;
- Remove soils having 2,3,7,8-TCDD concentrations greater than 2 ppb in the 0 to 12 foot soil profile (completed);
- Remove free phase product to the extent technically feasible (as demonstrated by field pilot studies); and
- Establish a Deed Notice and engineering controls for those areas that encompass soils impacted above the RDCSCC and which are bounded by areas that are less than the RDCSCC.

1.5 *REPORT ORGANIZATION*

The remainder of the RAWP are divided into the following sections:

- *Section 2 Background* summarizes the history of the Facility and the geologic and hydrogeologic setting of the Facility;
- *Section 3 Investigative Methods* provides a description of investigation activities completed in each area of concern;
- *Section 4 Results of the Investigation* presents the data collected during the investigation activities;
- *Section 5 Summary of Results* summarizes the key findings and conclusions;
- *Section 6 Remedial Action Selection* provides a description of the proposed remedial strategies and factors which influence the selected strategies; and

- *Section 7 Remedial Action Work Plan* summarizes the proposed remedial action for the Facility.
- *Section 8 Certification* provides the signed and notorized certification form for this RAWP.
- *Section 9 References* provides a comprehensive list of the documents referenced in this RAWP.

- Building 95
- Building 200

3.11.2 *2,3,7,8-TCDD Sampling*

In addition to the above referenced work, separate analysis for 2,3,7,8-TCDD was completed in former drum storage areas including those formerly located under buildings. In addition, areas of suspected 2,3,7,8-TCDD contamination, which were identified during previous site investigations but could not be sampled due to production operations in the buildings, were sampled. Samples were collected on a 30-foot grid, in and between Buildings 93, 95, 68/168, 50 Pad and 60 Pad. Sample locations between buildings were designated DSB, and all other samples were appropriately named, according to the building designation. Sample locations are shown on Figure 3-1.

Samples were taken from depths of 0 to 2 feet, 5 to 6 feet and 10 to 12 feet below grade. The first two depth interval samples were analyzed for 2,3,7,8-TCDD. If 2,3,7,8-TCDD was detected above 1 μg/Kg in either of the more shallow soil intervals (site-specific action level developed as part of the *Remedial Action Work Plan for 2,3,7,8-TCDD Impacted Soils* (ERM, 1996), the third depth interval was analyzed. If 2,3,7,8-TCDD was detected above 1 μg/Kg, additional horizontal delineation borings were also installed to further delineate the horizontal and vertical extent.

As described in the *September 1999 Planned 2,3,7,8-TCDD Activity* document, all soil containing greater then 2 ppb of 2,3,7,8-TCDD was removed in late 1999 and disposed off-site.

3.12 *INVESTIGATION METHODS FOR AOCS IDENTIFIED IN THE PAR (i.e., MISCELLANEOUS AREAS)*

A complete list of AOCs, which were identified in the PAR and investigated following the cessation of operations at the Facility in July 1998, is provided on Table 3-2. Table 3-2 also identifies the document that reports the findings associated with the investigation of each AOC. For the AOC investigations documented in this RAWP, Table 3-2 includes the report section where the results are discussed. The investigative methods for the AOCs that were not discussed as part of Area A, Area B, Area C, or the Building Areas are described below.

was completed to identify the precise locations of these cesspools. The survey revealed the presence of four geophysical anomalies in this area, whose GPR responses were similar to what would be expected from filled cesspools. The anomaly locations were marked and labeled onsite with spray paint.

In January 1999, a boring was advanced through each of the suspected cesspool locations. In total, four borings (CP-8, CP-9, CP-10, and CP-11) were advanced to investigate these cesspools (Plate 18). Soil samples were collected from each boring at depths corresponding to the suspected bottom depth of the cesspool (between 10 and 12 feet), immediately above the inferred water table (between 35 and 37 feet), and an intermediate depth (between 25 and 27 feet). In-situ ground water samples were also collected at each boring location. All soil and ground water samples were analyzed for TCL VOCs, TCL SVOCs and TAL metals.

3.12.5 *Transformers/Electrical Switching Stations*

All but two electrical transformers were staged on concrete pads with secondary concrete containment. The pad and secondary containment for each transformer was visually inspected. No breaches in the integrity of the concrete or evidence of discharge of oil were apparent.

Two transformers, located adjacent to Building 99, were staged on concrete pads without secondary containment. Eight surface soil samples (PCB-01 through PCB-08) were collected from around the perimeters of each pad (within 1 foot of the pad) and analyzed for TCL PCBs (Figure 3-4).

To investigate potential PCB-impacts on soils proximal to two electrical switching stations, surface soil samples were collected in front of the doorway to each. If spillage occurred within a switching station, it would have been contained on all sides, except beneath the doorway. The soil sample, PCB-09 (0-0.5), was collected in front of the door to the switching station located to the south of Building 95 (Plate 14). The soil sample, PCB-10 (0-0.5), was collected in front of the door to the switching station located to the west of Building 7 (Plate 8). Both samples were analyzed for TCL PCBs.

3.12.6 *Dichlorophenol Pit*

Based on communication with a former Givaudan employee, a pit that reportedly received discharges of waste dichlorophenol was historically located in the western end of Building 168. The existence of this pit could not be confirmed from any other historical information, however, one soil

43, 44, 45, 46, and 47), 50 Pad (former Buildings 52, 53, 54, 55, and 56), and 60 Pad (former Buildings 58, 59, 60, 61, 62, and 63). Buildings that were demolished and the foundations removed included: Building 25 Area (former Buildings 10, 21, 22, 23, 24, 25, 28, 29, 30, 31, and 32), Building 50, and Building 72 Area (former Buildings 67, 72, and 86). Field work started in the late fall of 1998 and continued through the winter of 1999 as building areas became accessible.

4.5.1 *2,3,7,8-TCDD Sampling*

In addition to the above referenced work, separate analysis for 2,3,7,8-TCDD was completed in former drum storage areas including those beneath existing buildings. In addition, areas of suspected 2,3,7,8-TCDD contamination, which were identified during previous site investigations but could not be sampled due to production operations in the buildings, were sampled. Samples were collected on a 30-foot grid, in and between Buildings 93, 95, 68/168, 50 Pad and 60 Pad. Sample locations between buildings were designated DSB, and all other samples were appropriately named, according to the building designation. Sample locations and corresponding analytical results are shown on Plate 7. Soils containing greater that 2 ppb of 2,3,7,8-TCDD, at depths less than 12 feet below grade, were excavated and disposed offsite.

4.5.2 *Building Results*

The following sections present a summary of the building soil sample analytical results. Samples that contained constituents at concentrations exceeding the more stringent of their respective RDCSCC or IGWSCC criteria are addressed. Sample exceedances are shown on Plates 8 to 20 and in tables in Appendix G. A comprehensive summary of analytical results for all of the samples collected during the soils investigation is presented in Appendix H.

There were five main VOCs of concern including 1,2-DCA, cis-1,2-DCE, ethylbenzene, toluene, and TCE. To keep track of these compounds and their exceedances, a series of bar graphs were prepared to highlight the total exceedances of each compound in each building area, as well as the total number of "U" qualified samples. The "U" qualified values are reported as half of the detection limit. These figures (Figure 4-B through Figure 4-W) are discussed for each building area under the section for VOCs, and are included at the end of Section 4.

MSB-5DS52 (0-2) and MSB-6DS52 (0-2). All remaining SVOC exceedances were vertically and horizontally delineated in this area for the RDCSCC.

Metals

Two samples in Building 92, one sample in Building 57 and six samples in Building RDS contained metals in exceedance of the RDCSCC (Plate 10). Sample RDS-24 (1.5-2) contained lead at a concentration of 3,870 mg/kg, exceeding the NRDCSCC.

Barium exceeded the RDCSCC the most number of times (six) and antimony, lead and nickel each exceeded once. All samples found to exceed either the RDCSCC or the NRDCSCC for metals were vertically delineated. Sample MSB-3DS92 (0-2) provided horizontal delineation for SB92-01 (0-2), which was the only sample with a metal exceedance near the perimeter of the Facility in this area.

4.5.2.7 *Buildings 68 and 168*

VOCs

Eleven locations within the Building 68 and 168 area had samples containing VOCs in exceedance if the IGWSCC (Plate 11). Sample SB68A-11 (0-2) contained 1,2-DCA in exceedance of the NRDCSCC (54,000 ug/kg) and samples SB68A-02 (0-2), SB68A-11 (5-6) and SB168-04 (0-2) contained concentrations of 1,2-DCA in exceedance of the RDCSCC (21,000 ug/kg, 8,300 ug/kg, and 11,000 ug/kg respectively).

1,2-DCA exceeded the IGWSCC the most frequently, a total of nine times, and by the largest magnitude. The highest 1,2-DCA concentration was 54,000 ug/kg, exceeding the IGWSCC by 54 times. Excluding 1,2-DCA, all other VOC exceedances were below 11 times their respective IGWSCC.

Figures 4-I and 4-J compare the five VOCs of concern to the IGWSCC, for Buildings 68 and 168, and show the number of detected and non-detected concentrations relative to the standard. Of the five VOCs of concern, 1,2-DCA exceeded the IGWSCC in three samples in Building 68 and in six samples in Building 168. TCE exceeded the IGWSCC in four samples in Building 68, with a maximum concentration of 11,000 ug/kg. The remaining VOCs of concern were either below the IGWSCC or "U" qualified.

The only two samples not vertically delineated for VOCs in Buildings 68 and 168 were SB68A-08 (10-12) and SB16A-11 (10-12). They contained carbon tetrachloride and dichloromethane, respectively, at concentrations

One sample, 50-11 (3.5-4) contained three metals at concentrations exceeding the RDCSCC. One of these metals (lead) also exceeded the NRDCSCC. No other samples contained metals above the RDCSCC.

5.5.12 *Building 72*

Sixty-two soil samples were collected from the grid of borings installed over the Building 72 area, and analyzed for TCL VOCS, TCL SVOCs and TAL metals. Chromium has been identified as the primary COC in this area, based on the analytical results for these samples (Plate 20).

One sample (72-30 (2-2.5)) contained a VOC above the IGWSCC. The concentration of carbon tetrachloride (6,600) exceeded the IGWSCC (1,000) by a factor of 6.6. This concentration also exceeds the RDCSCC and NRDCSCC, and has not been vertically delineated. However, since carbon tetrachloride has not been detected in ground water samples from any existing Facility monitoring wells, this exceedance is not believed to represent a potential source for impacted ground water (IGWR, ERM, February 2000).

No SVOCs were detected above the IGWSCC, RDCSCC or NRDCSCC in samples collected from the Building 72 area.

Twenty-three samples contained a metal at a concentration exceeding the RDCSCC. Chromium was detected above the RDCSCC in 21 samples, but did not exceed the NRDCSCC. Arsenic was detected above the RDCSCC/NRDCSCC (these criteria are the same for arsenic) in two samples. Vertical delineation of these metal exceedances has not been attained for 18 different sampling locations in the Building 72 Area. However, results from the most recent low-flow sampling of MW-10S, located approximately 200 feet east (downgradient) of the Building 72 area, do not indicate that these metals are impacting ground water, as they are detected below the Department's Ground Water Quality Criteria (IGWR, ERM, February 2000).

5.5.13 *2,3,7,8-TCDD Investigation in Building Areas*

Analysis for 2,3,7,8-tetrachloro-*p*-dioxin (2,3,7,8-TCDD) was completed in former drum storage areas in 1999, including those beneath existing buildings. In addition, areas of suspected 2,3,7,8-TCDD contamination, which were identified during previous site investigations but could not be sampled due to production operations in the buildings, were sampled. Samples were collected on a 30-foot grid, in and between Buildings 93, 95, 68/168, 50 Pad and 60 Pad. Sample locations between buildings were designated DSB, and all other samples were appropriately named, according to the building designation. Sample locations and corresponding analytical results are shown on Plate 7. Soils containing greater that 2 ppb of 2,3,7,8-TCDD, at depths up to 12 feet below grade, were excavated and disposed offsite in November/December 1999. The relevant reports for this removal activity are included in Appendix B.

5.6 *MISCELLANEOUS AOCS INDENTIFIED IN THE PAR*

A complete list of AOCs, which were identified in the PAR and investigated following the cessation of operations at the Facility in July 1998, is provided on Table 3-3. For the "miscellaneous AOCs", which were not summarized in a separate report, or as part of Area A, Area B, Area C or the Building Areas, the significant investigation findings are provided herein.

The following is a list of potential AOCs that were investigated and found to be of no further concern, based on analytical results that were below the Department's Soil Cleanup Criteria:

- Drainage Swale (near Building 99)
- Cesspools (excluding those in Area A)
- Electrical Transformers/Switching Stations
- Dichlorophenol Pit (in the Building 168 Area)
- Wall Stain on Building 94
- External Fill Station (in the Building 95 Area)
- Sediment Accumulation Area

The other miscellaneous AOCs, where evidence of impacted soil/sediment has been found, are summarized below and include:

- Railroad Spur (along western property boundary):
- Roof Leader (at Building 9)
- Drainage Swale (at western property boundary)
- Chemical Landfill

5.6.1 *Railroad Spur*

Twenty-three soil samples were collected from seven borings, which were spaced approximately 100 feet apart along the railroad spur, and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides, TCL PCBs and TAL metals. Based on the analytical data from these samples, the soils beneath the railroad spur are not believed to be of significant environmental concern, given the surface paving as part of the intended future use of the property, even though exceedances of the Department's soil cleanup

Appendix B
1999 2,3,7,8 TCDD Activity Documents

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State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

CERTIFIED MAIL
RETURNED RECEIPT REQUESTED
NO. Z754 468 586

OCT 26 1999

Gene Thomas, Director, EH&S Programs
Givaudan Roure Corporation
International Trade Center
300 Waterloo Valley Road
Mt. Olive, NJ 07828

Re: Givaudan Roure Corporation ("Givaudan")
125 Delawanna Avenue, Clifton, Passaic County
Administrative Consent Order Dated: February 16, 1988
ISRA Case #97404 / Remediation Agreement Dated: January 1, 1998
September 3, 1999 "Planned 2,3,7,8-TCDD Activity"

Dear Mr. Thomas:

The New Jersey Department of Environmental Protection ("NJDEP" or "Department") has reviewed the September 3, 1999 letter and the September 24, 1999 e-mail submitted by Environmental Resources Management, Inc. ("ERM"), on behalf of Givaudan Roure Corporation ("Givaudan"). These documents discuss Givaudan's additional delineation efforts and proposed remedial action for 2,3,7,8-TCDD impacted soils at the facility.

Based on the above-referenced review, the Department has determined that the additional delineation conducted by ERM and the areas proposed to be excavated are acceptable to the Department. However, since laboratory deliverables (full deliverables) have not been submitted, the investigation and remediation proposed by Givaudan are approved based on the assumption that the data are usable. As previously requested, it is highly recommended that the data be submitted to the Department for validation as soon as practicable, since it will take several months to complete the data validation.

This concludes the Department's comments. If you have any questions, please contact me at (609) 633-0715 or at mspera@dep.state.nj.us.

Sincerely,

Maria Franco-Spera

Maria Franco-Spera, Case Manager
Bureau of State Case Management

C: Chris Kanakis, Acting Section Chief, BSCM, NJDEP
Ann Charles, Technical Coordinator, BEERA, NJDEP
Daryl Clark, Geologist, BGWPAb, NJDEP
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ERM

3 September, 1999
Reference: 22321.50.01

Ms. Maria Franco-Spera
Case Manager
Bureau of State Case Management
New Jersey Department of Environmental Protection
401 East State Street
CN048
Trenton, New Jersey 08625

RE: Planned 2,3,7,8-TCDD Activity
Givaudan Roure Corporation
100 Delawanna Avenue, Passaic County
Clifton, New Jersey Facility

Dear Ms. Franco-Spera:

As you are aware, Environmental Resource Management (ERM), on behalf of Givaudan Roure Corporation (Givaudan Roure), has been completing investigative and remedial action work at the Clifton, New Jersey Facility (Facility). As requested in the 12 August 1999 meeting with the New Jersey Department of Environmental Protection (NJDEP) project team, ERM is submitting this letter and the enclosed attachments to facilitate your review of the following:

- The delineation of 2,3,7,8-tetrachlorodibenzo-p dioxin (2,3,7,8-TCDD) impacted soil at the Facility,
- The proposed excavation areas,
- The proposed excavation plan,
- Analytical data of soil exceedences other than 2,3,7,8-TCDD in the proposed excavation areas, and
- Analytical data associated with Toxicity Characteristic Leaching Procedure (TCLP) characterization of the soils containing greater than 2 parts per billion (ppb) of 2,3,7,8-TCDD.

DELINEATION AND PROPOSED EXCAVATION AREAS

As indicated in the Draft Status Report, dated 23 June 1999, Givaudan Roure is proposing to excavate and dispose of soil containing concentrations of 2,3,7,8-TCDD greater than 2 ppb to a depth of up to 12 feet below current grade. Recent sampling has delineated the horizontal and vertical extent of the 2,3,7,8-TCDD impacted soils. This letter describes the delineation of these soils and identifies the focused delineation sampling requested by the NJDEP that will be collected prior to excavating the 2,3,7,8-TCDD impacted soils.

Based on aerial photography, sampling for 2,3,7,8-TCDD was conducted in areas identified as past drum storage areas and, from previous site investigations, areas of suspected 2,3,7,8-TCDD contamination that could not be sampled in the previous investigation due to production operations in the buildings. Delineation is described for each of the four buildings/pads within which 2,3,7,8-TCDD was detected including the 60 Pad, Building 93, Building 95, and Building 168/68. Horizontal and vertical extents are defined by soils whose analyses indicate 2,3,7,8-TCDD concentrations below 2 ppb for depth specific intervals. Table 1 presents the 2,3,7,8-TCDD concentrations of soil samples collected at locations where at least one sample depth exceeded 2 ppb. Figures 1 through 4 show the sample locations, results and proposed excavation areas for each of the four building pads discussed below.

60 Pad

Two areas within the footprint of the 60 Pad have been identified as containing soil with concentrations of 2,3,7,8-TCDD greater than 2 ppb. The first area is located in the vicinity of 60 Pad SB-19; the second, in the vicinity of 60 Pad SB-21. In the vicinity of 60 Pad SB-19, the vertical extent of 2,3,7,8-TCDD is defined by sampling points where 2,3,7,8-TCDD has been detected at or below 2 ppb at a depth below where 2,3,7,8-TCDD had been detected above 2 ppb. These samples points are 60 Pad SB-19-01 at a depth of 6.0-6.5' and by 60 Pad SB-19-03 at a depth of 1.5-2.0'. The horizontal extent of 2,3,7,8-TCDD is defined by 60 Pad SB-19-03, 60 Pad SB-19-04, 60 Pad SB-19-06, and 60 Pad SB-19-07 for soils up to a depth of six feet. For soils up to two feet deep in the vicinity of 60 Pad SB-19-03, the horizontal extent is defined by 60 Pad SB-19, 60 Pad SB-19-09, 60 Pad SB-19-10, and the building foundation at 60 Pad SB-19-08 where auger refusal was initially encountered and, upon a second attempt, concrete was encountered to a depth of four feet. In the vicinity of 60 Pad SB-21, the vertical extent of 2,3,7,8-TCDD is defined by 60 Pad SB-19 at a depth of 12.0-12.5' and by 60 Pad SB-21-04 at a depth of 8.0-10.0'. The horizontal extent of 2,3,7,8-TCDD is defined by 60 Pad SB-21-01, 60 Pad SB-21-02, 60 Pad SB-21-03, and 60 Pad SB-21-08. Figure 1 presents 2,3,7,8-TCDD analytical results and the proposed excavation plan for the 60 Pad. Based on this excavation plan, approximately 50 cubic yards will be removed from beneath the 60 Pad and disposed.

Building 93

Two areas within the footprint of Building 93 have been identified as containing greater than 2 ppb 2,3,7,8-TCDD. One area is focused around SB 93-1/1A and the other around SB 93-3. The vertical extent of 2,3,7,8-TCDD is defined by depth intervals of 5.0-6.0' and 6.0-8.0', respectively. Similarly, the horizontal extent around SB 93-1/1A is defined by SB 93-1-1, SB 93-1-2, SB 93-1-3, and SB 93-1-4. The horizontal extent around SB 93-3 is defined by SB 93-3-1, SB 93-3-2, SB 93-3-3, and SB 93-3-4. Figure 2 presents 2,3,7,8-TCDD analytical results and the proposed excavation plan for the soil beneath the Building 93 slab. Based on this excavation plan, approximately 30 cubic yards will be removed from within the footprint of Building 93 and disposed.

Building 95

Within the footprint of Building 95, soil having concentrations greater than 2 ppb of 2,3,7,8-TCDD is found in the vicinity of SB 95-8. The vertical extent of 2,3,7,8-TCDD beyond 12 feet is defined by SB 95-8 at a depth of 15-16'. As indicated on Figure 3, the horizontal extent of 2,3,7,8-TCDD is defined, in part, by SB 95-8-1, SB 95-8-2, SB 95-8-9, SB 95-8-10, SB 95-8-13, and SB 95-8-15. Based on the 12 August 1999 meeting, ERM will collect an additional sample south of SB 95-8-3 to further define the limit of the planned excavation area. Figure 3 presents the 2,3,7,8-TCDD analytical results and the proposed excavation plan for the soil beneath the Building 95 slab. Based on this excavation plan, approximately 60 cubic yards will be removed from beneath Building 95 and disposed.

Building 168/68

Within the footprint of Building 168/68, 2,3,7,8-TCDD was detected at a concentration greater than 2 ppb at SB 168-07. The vertical extent of 2,3,7,8-TCDD is defined by a depth interval of 5.0-6.0'. The horizontal extent is defined by sample locations SB 168-07-01, SB 168-07-02, SB 168-

07-03, and SB 168-07-04. Figure 4 presents the 2,3,7,8-TCDD analytical results and the proposed excavation plan for the soil beneath the Building 168/68 slab. Based on this excavation plan, approximately 10 cubic yards will be removed from beneath the Building 168/68 slab and disposed.

PROPOSED EXCAVATION PLAN.

Soils containing concentrations greater than 2 ppb of 2,3,7,8-TCDD, based on existing analytical results as presented herein and as further defined by collecting one sample in Building 95, south of SB95-8-3, will be excavated. The estimated volume of soil is approximately 150 cubic yards. Since Givaudan Roure has already delineated 2,3,7,8-TCDD impacted soil above 2 ppb, no post excavation sampling is planned. The excavated areas will be backfilled, compacted, and graded to support redevelopment of the affected areas. The excavated soil will be shipped, based on the anticipated volume, via truck from the site to the Port Arthur Incinerator/Onyx Environmental Services's facility in Port Arthur, Texas. This facility is permitted to receive and handle these soils. Rail transportation will be used if the volume of soil makes truck transportation less economical. Engineering and institutional controls will be proposed to complete the remedy.

NON-TCDD SOIL EXCEEDENCES IN PROPOSED EXCAVATION AREAS

Figures 1 through 4 present the Non-TCDD soil exceedences for soil samples collected in the proposed excavation areas. Exceedences were determined by screening analytical data against the more stringent of the Residential Direct Contact Soil Cleanup Criteria and the Impact to Groundwater Soil Cleanup Criteria.

TCLP CHARACTERIZATION OF 2,3,7,8-TCDD IMPACTED SOIL

For the purpose of characterizing the soils containing greater than 2 ppb of 2,3,7,8-TCDD for disposal, ERM collected two samples for TCLP analysis. Based on available analytical data, ERM collected these samples at locations within the proposed excavation areas where TCLP parameters were detected at their highest concentrations. Samples were collected at SB95-8 (5-6') for TCLP semivolatiles and at SB93-1(10-12') for TCLP volatiles and TCLP metals. No TCLP parameter was detected above the TCLP level for hazardous waste characterization. The results are presented in Table 2.

ERM and Givaudan Roure would appreciate the Departments' timely review of this letter and the enclosed attachments so that Givaudan Roure can proceed with planning the removal of 2,3,7,8-TCDD soils greater than 2 ppb within these former building areas. We continue to move forward with planning stages of this activity and anticipate, based on a favorable review, to proceed with excavation activities in the beginning of October 1999. We anticipate that excavation, disposal, and backfilling operations will be completed in approximately one month. We look forward to the Department's acceptance of our delineation and the proposed excavation areas and look forward to initiating the remedial action. Please note that analytical results for the additional sample collected at SB95-8-3 will be forward to NJDEP upon receipt from the laboratory. Once the additional data is submitted we would appreciate a written approval from the NJDEP for the planned removal activity.

If you have any questions or require any clarification, please contact Mr. Dave Johnson (973-448-6584) or Mr. Gene Thomas (973-448-6555) of Givaudan Roure or one of the undersigned. Please note that these are new phone numbers for Messrs. Johnson and Thomas. Thank you.

Sincerely,

Rich Wroblewski

Richard T. Wroblewski, P.G.

Andrew H. Thalheimer

Andrew H. Thalheimer, P.E.

RTW/aht
enclosures:
cc: David Johnson, Givaudan Roure
Gene Thomas, Givaudan Roure
Ron Fender, ERM
Mike Eversman, ERM
Stuart Bills, ERM

Table 1
Summary of 2,3,7,8-TCDD Results Greater than 2 µ g/Kg

Sample Identification	Sample Interval (ft bgs)	2,3,7,8-TCDD Concentration (ppb)
60 Pad SB-19	0.5 to 1	0.405 E
	2 to 4	0.0106
	5.5 to 6	**2.490 E**
	6 to 8	0.00333
	10 to 10.5	0.114
60 Pad SB-21	2 to 2.5	**10.000 E**
	5.5 to 6	1.410 E
	8 to 8.5	**4.151 E**
	11.5 to 12	**2.660 E**
	12 to 12.5	1.546 E
60 Pad SB-19-1	0.5 to 1	0.012
	2 to 2.5	**15.300 E**
	4 to 4.5	**2.266 E**
	6 to 6.5	0.125
60 Pad SB-19-3	0 to 0.5	**3.089 E**
	1.5 to 2	0.903 E
	4 to 4.5	0.0843
60 Pad SB-21-4	0 to 2	0.0361
	4 to 6	**4.184 E**
	8 to 10	0.842 E
	10 to 12	1.045 E
SB168-07	0 to 2	14.800 E
	2 to 4	14.000 E
	5 to 6	0.0103
SB93-1	0 to 2	**16.200 E**
	5 to 6	0.0025
SB93-1A	2 to 4	**6.170 E**
SB93-3	0 to 2	**13.590 E**
	5 to 6	**18.790 E**
	6 to 8	0.0342
	8 to 8.5	0.00446
	9 to 10	0.0152
SB95-8	0 to 2	1.970 E
	5 to 6	1.510 E
	10 to 11	**7.170 E**
	11 to 12	**12.800 E**
	15 to 16	1.450 E
	18 to 20	0.0787
	23 to 24	**2.030 E**
	26 to 27	0.0189
SB95-8-3	0 to 2	**14.350 E**
	2 to 4	1.300 E
	5 to 6	0.0135
	10 to 12	0.389
SB95-8-5	0 to 2	**2.310 E**
SB95-8-5D	0 to 2	**2.530 E**
	5 to 5	**2.280 E**
	6 to 8	1.890 E
	10 to 12	1.230 E
	14 to 16	0.288
	18 to 20	0.0312
	22 to 24	0.284
SB95-8-14	0 to 2	**3.010 E**
	2 to 4	0.0135
	5 to 6	0.133
	10 to 12	0.0012
SB95-8-14D	10 to 12	0.0021
	14 to 16	0.0115
	18 to 20	(0.00089) J
	23 to 23.5	0.0096
	27 to 27.5	0.0011

Table 2
TCLP Analysis of 2,3,7,8-TCDD Impacted Soil

EPA HW No.	Contaminant	Regulatory CAS No. [2]	TCLP Level [5] (mg/L)	SB95-8 (5-6') (mg/L)	SB93-1 (10-12') (mg/L)
D004	Arsenic	7440-38-2	5	NA	0.0029 U
D005	Barium	7440-39-3	100	NA	0.77
D018	Benzene	71-43-2	0.5	NA	0.100 U
D006	Cadmium	7440-43-9	1	NA	0.000190 U
D019	Carbon tetrachloride	56-23-5	0.5	NA	0.100 U
D020	Chlordane [6]	57-74-9	0.03	NA	NA
D021	Chlorobenzene	108-90-7	100	NA	0.100 U
D022	Chloroform	67-66-3	6	NA	0.100 U
D007	Chromium	7440-47-3	5	NA	0.000560 U
D023	o-Cresol (aka 2-Methylphenol)	95-48-7	200.0 [4]	0.010 U	NA
D024	m-Cresol	108-39-4	200.0 [4]	NA	NA
D025	p-Cresol (aka 4-Methylphenol)	106-44-5	200.0 [4]	NA	NA
D026	Cresol		200.0 [4]	0.010 U	NA
D016	2,4-D [6]	94-75-7	10	NA	NA
D027	1,4-Dichlorobenzene	106-46-7	7.5	NA	0.100 U
D028	1,2-Dichloroethane	107-06-2	0.5	NA	0.100 U
D029	1,1-Dichloroethylene	75-35-4	0.7	NA	0.100 U
D030	2,4-Dinitrotoluene	121-14-2	0.13 [3]	0.010 U	NA
D012	Endrin [6]	72-20-8	0.02	NA	NA
D031	Heptachlor (and its epoxide) [6]	76-44-8	0.008	NA	NA
D032	Hexachlorobenzene	118-74-1	0.13 [3]	0.010 U	NA
D033	Hexachlorobutadiene	87-68-3	0.5	0.010 U	NA
D034	Hexachloroethane	67-72-1	3	0.010 U	NA
D008	Lead	7439-92-1	5	NA	0.022 B
D013	Lindane [6]	58-89-9	0.4	NA	NA
D009	Mercury	7439-97-6	0.2	NA	0.000075 B
D014	Methoxychlor [6]	72-43-5	10	NA	NA
D035	Methyl ethyl ketone	78-93-3	200	NA	0.200 U
D036	Nitrobenzene	98-95-3	2	0.010 U	NA
D037	Pentachlorophenol	87-86-5	100	0.050 U	NA
D038	Pyridine	110-86-1	5.0 [3]	0.020 U	NA
D010	Selenium	7782-49-2	1	NA	0.02 U
D011	Silver	7440-22-4	5	NA	0.000690 U
D039	Tetrachloroethylene	127-18-4	0.7	NA	0.100 U
D015	Toxaphene [6]	8001-35-2	0.5	NA	NA
D040	Trichloroethylene	79-01-6	0.5	NA	0.100 U
D041	2,4,5-Trichlorophenol	95-95-4	400	220	NA
D042	2,4,6-Trichlorophenol	88-06-2	2	0.010 U	NA
D017	2,4,5-TP (Silvex) [6]	93-72-1	1	NA	NA
D043	Vinyl chloride	75-01-4	0.2	NA	0.200 U

Notes:

1 Hazardous waste number.

2 Chemical abstracts service number.

3 Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

4 If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used.

5 Maximum Concentration of Contaminants for the Toxicity Characteristic Leaching Procedure

6 Parameter is Pesticide or Herbicide and was NOT analyzed.

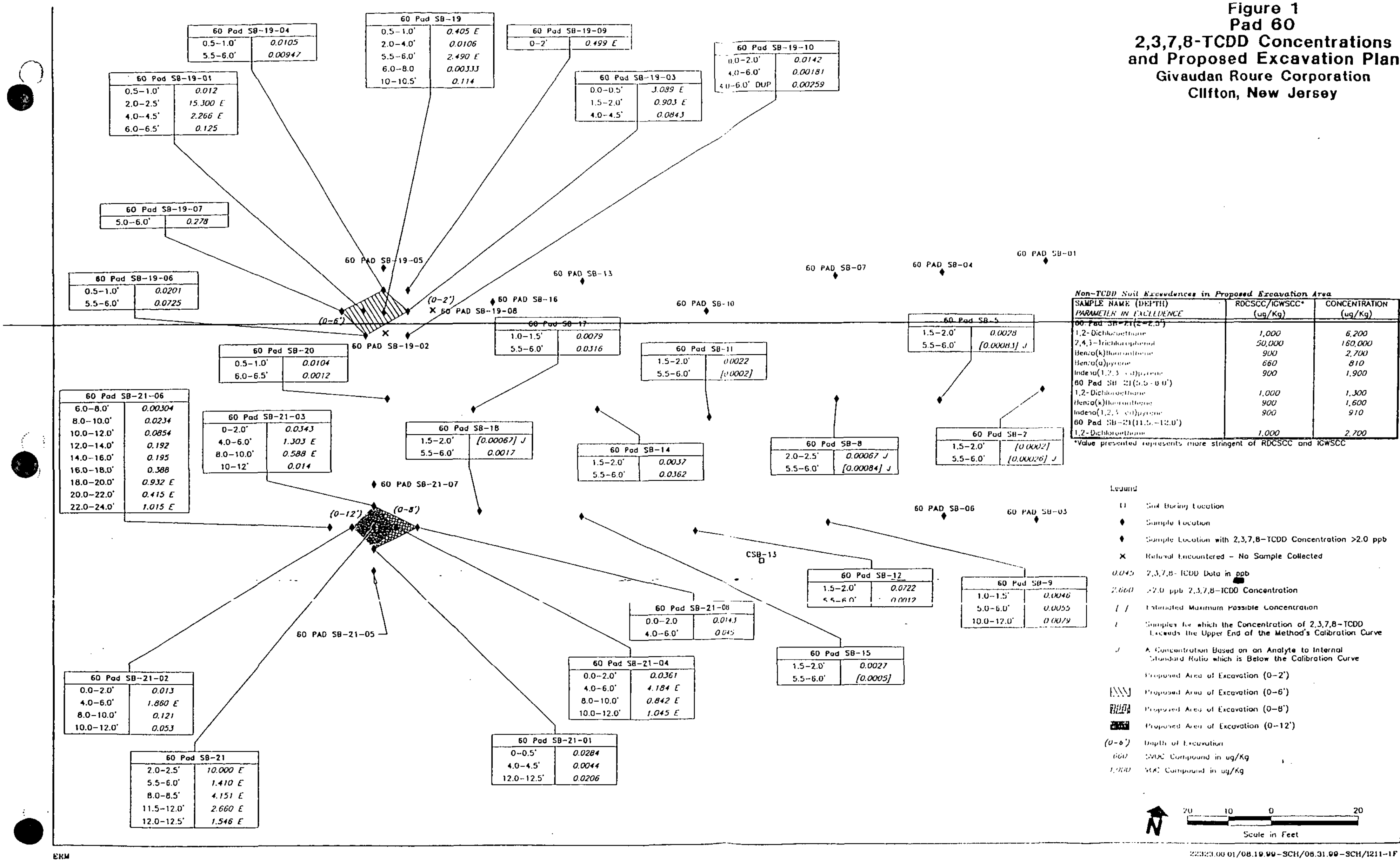
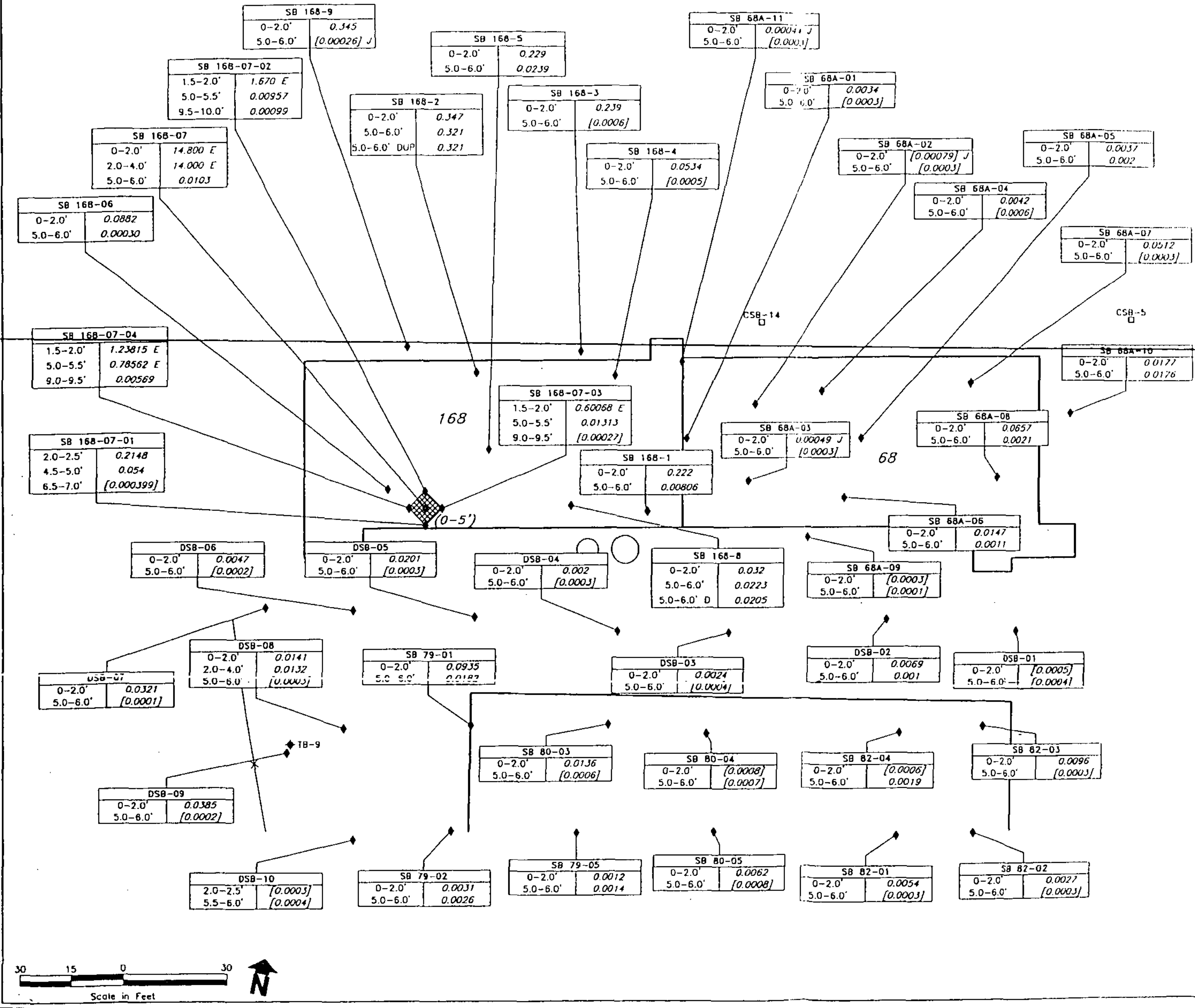


Figure 1
Pad 60
2,3,7,8-TCDD Concentrations
and Proposed Excavation Plan
Givaudan Roure Corporation
Clifton, New Jersey
60 Pad SB-19-04
0.5-1.0' 0.0105
5.5-6.0' 0.00947
60 Pad SB-19
0.5-1.0' 0.405 E
2.0-4.0' 0.0106
5.5-6.0' 2.490 E
6.0-8.0 0.00333
10-10.5' 0.114
60 Pad SB-19-09
0-2' 0.499 E
60 Pad SB-19-10
0.0-2.0' 0.0142
4.0-6.0' 0.00181
4.0-6.0' DUP 0.00259
60 Pad SB-19-01
0.5-1.0' 0.012
2.0-2.5' 15.300 E
4.0-4.5' 2.266 E
6.0-6.5' 0.125
60 Pad SB-19-03
0.0-0.5' 3.089 E
1.5-2.0' 0.903 E
4.0-4.5' 0.0843
60 Pad SB-19-07
5.0-6.0' 0.278
60 PAD SB-19-05
60 PAD SB-13
60 PAD SB-07
60 PAD SB-04
60 PAD SB-01
60 Pad SB-19-06
0.5-1.0' 0.0201
5.5-6.0' 0.0725
(0-2')
60 PAD SB-16
60 PAD SB-19-08
60 PAD SB-10
(0-6')
60 PAD SB-19-02
60 Pad SB-17
1.0-1.5' 0.0079
5.5-6.0' 0.0316
60 Pad SB-5
1.5-2.0' 0.0028
5.5-6.0' [0.00083] J
60 Pad SB-20
0.5-1.0' 0.0104
6.0-6.5' 0.0012
60 Pad SB-11
1.5-2.0' 0.0022
5.5-6.0' [0.0002]
Non-TCDD Soil Exceedences in Proposed Excavation Area
SAMPLE NAME (DEPTH) / PARAMETER IN EXCEEDENCE | RDCSCC/IGWSCC* (ug/Kg) | CONCENTRATION (ug/Kg)
60 Pad SB-21(2-2.5')
1,2-Dichloroethane 1,000 6,200
2,4,5-Trichlorophenol 50,000 160,000
Benzo(k)fluoranthene 900 2,700
Benzo(a)pyrene 660 810
Indeno(1,2,3-cd)pyrene 900 1,900
60 Pad SB-21(5.5-6.0')
1,2-Dichloroethane 1,000 1,300
Benzo(k)fluoranthene 900 1,600
Indeno(1,2,3-cd)pyrene 900 910
60 Pad SB-21(11.5-12.0')
1,2-Dichloroethane 1,000 2,700
*Value presented represents more stringent of RDCSCC and IGWSCC
60 Pad SB-21-06
6.0-8.0' 0.00304
8.0-10.0' 0.0234
10.0-12.0' 0.0854
12.0-14.0' 0.192
14.0-16.0' 0.195
16.0-18.0' 0.388
18.0-20.0' 0.932 E
20.0-22.0' 0.415 E
22.0-24.0' 1.015 E
60 Pad SB-21-03
0-2.0' 0.0343
4.0-6.0' 1.303 E
8.0-10.0' 0.588 E
10-12' 0.014
60 Pad SB-18
1.5-2.0' [0.00067] J
5.5-6.0' 0.0017
60 Pad SB-14
1.5-2.0' 0.0037
5.5-6.0' 0.0362
60 Pad SB-8
2.0-2.5' 0.00067 J
5.5-6.0' [0.00084] J
60 Pad SB-2
1.5-2.0' [0.0002]
5.5-6.0' [0.00026] J
60 PAD SB-21-07
(0-12')
(0-8')
60 PAD SB-06
60 PAD SB-03
CSB-13
60 Pad SB-12
1.5-2.0' 0.0722
5.5-6.0' 0.0012
60 Pad SB-9
1.0-1.5' 0.0046
5.0-6.0' 0.0055
10.0-12.0' 0.0079
60 Pad SB-21-08
0.0-2.0 0.0143
4.0-6.0' 0.045
60 PAD SB-21-05
60 Pad SB-15
1.5-2.0' 0.0027
5.5-6.0' [0.0005]
60 Pad SB-21-04
0.0-2.0' 0.0361
4.0-6.0' 4.184 E
8.0-10.0' 0.842 E
10.0-12.0' 1.045 E
60 Pad SB-21-02
0.0-2.0' 0.013
4.0-6.0' 1.860 E
8.0-10.0' 0.121
10.0-12.0' 0.053
60 Pad SB-21-01
0-0.5' 0.0284
4.0-4.5' 0.0044
12.0-12.5' 0.0206
60 Pad SB-21
2.0-2.5' 10.000 E
5.5-6.0' 1.410 E
8.0-8.5' 4.151 E
11.5-12.0' 2.660 E
12.0-12.5' 1.546 E
Legend
Soil Boring Location
Sample Location
Sample Location with 2,3,7,8-TCDD Concentration >2.0 ppb
Refusal Encountered - No Sample Collected
0.045 2,3,7,8-TCDD Data in ppb
2.660 >2.0 ppb 2,3,7,8-TCDD Concentration
[ ] Estimated Maximum Possible Concentration
E Samples for which the Concentration of 2,3,7,8-TCDD Exceeds the Upper End of the Method's Calibration Curve
J A Concentration Based on an Analyte to Internal Standard Ratio which is Below the Calibration Curve
Proposed Area of Excavation (0-2')
Proposed Area of Excavation (0-6')
Proposed Area of Excavation (0-8')
Proposed Area of Excavation (0-12')
(0-6') Depth of Excavation
660 SVOC Compound in ug/Kg
1,000 VOC Compound in ug/Kg
N
20 10 0 20
Scale in Feet
ERM
22323.00 01/08.19.99-SCH/08.31.99-SCH/1211-1F

932790459

Figure 4
Buildings 168 and 68
2,3,7,8-TCDD Concentrations and Proposed Excavation Plan
Givaudan Roure Corporation
Clifton, New Jersey



Non-TCDD Soil Exceedences in Proposed Excavation Area

SAMPLE NAME (DEPTH) *PARAMETER IN EXCEEDENCE*	RDCSCC/IGWSCC* (ug/Kg)	CONCENTRATION (ug/Kg)
SB168-7(0-2')		
Vinyl chloride	2,000	15,000 U
1,1,2,2-Tetrachloroethane	1,000	7,300 U
1,1,2-Trichloroethane	1,000	7,300 U
1,2-Dichloroethane	1,000	7,300 U
1,2-Dichloroethene(total)	1,000	15,000 U
Benzene	1,000	7,300 U
Bromodichloromethane	1,000	7,300 U
Bromoform	1,000	7,300 U
Bromomethane	1,000	15,000 U
Carbon Tetrachloride	1,000	7,300 U
Chlorobenzene	1,000	7,300 U
Chlorodibromomethane	1,000	7,300 U
Chloroform	1,000	7,300 U
cis-1,3-Dichloropropene	1,000	7,300 U
Dichloromethane	1,000	7,300 U
Tetrachloroethene	1,000	7,300 U
trans-1,3-Dichloropropene	1,000	7,300 U
Trichloroethene	1,000	7,300 U
Xylene (total)	10,000	22,000 U
Benzo(a)pyrene	660	3,000 U
Benzo(a)anthracene	900	3,000 U
Benzo(b)fluoranthene	900	3,000 U
Benzo(k)fluoranthene	900	3,000 U
Dibenzo(a,h)anthracene	660	3,000 U
N-Nitrosodi-n-propylamine	660	3,000 U
Dimethylphthalate	50,000	120,000
2,4-Dichlorophenol	10,000	77,000
2,4,5-Trichlorophenol	50,000	1,800,000
bis(2-Chloroethyl)ether	660	3,000 U
Hexachlorobutadiene	1,000	3,000 U
2,6-Dinitrotoluene	1,000	3,000 U
2,4-Dinitrotoluene	1,000	3,000 U
Hexachlorobenzene	660	3,000 U

*Value presented represents more stringent of RDCSCC and IGWSCC

Legend

- Soil Boring
- Toluene Boring Location
- Sample Location
- Sample Location with 2,3,7,8-TCDD Concentration >2.0 ppb
- 0.0042 — 2,3,7,8-TCDD Data in ppb
- 14.000 — >2.0 ppb 2,3,7,8-TCDD Concentration
- [ ] — Estimated Maximum Possible Concentration
- E — Samples for which the Concentration of 2,3,7,8-TCDD Exceeds the Upper End of the Method's Calibration Curve
- J — A Concentration Based on an Analyte to Internal Standard Ratio which is Below the Calibration Curve
- Proposed Area of Excavation (0-5')
- (0-5') — Depth of Excavation
- U — Indicates compound was analyzed for but not detected.
- 660 — SVOC Compound in ug/Kg
- 1,000 — VOC Compound in ug/Kg

ERM

22323.00.01/08.19.99-MKB/08.31.99-SCH/1209-1F

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J24

932790461

DRAFT REPORT

Givaudan Roure Corporation

2,3,7,8-TCDD Excavation and Disposal

Givaudan Roure Facility Clifton, New Jersey

March 2000

Environmental Resources Management
855 Springdale Drive
Exton, Pennsylvania 19341
File No.: 22323.00.01

932790462

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5	*60 Pad Excavated Area*
6	*Building 93 Excavated Areas*
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2	*TCLP Analysis of 2,3,7,8-TCDD Impacted Soil*

1.0 INTRODUCTION

On behalf of Givaudan Roure Corporation (Givaudan Roure), Environmental Resources Management, Inc. (ERM) has prepared this Remedial Action Report, consistent with NJAC 7:26-6.6, for the excavation and disposal of soils impacted by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD) at the Givaudan Roure Facility in Clifton, New Jersey (Facility). This remedial action was conducted from 9 November 1999 to 17 December 1999 in accordance with the "Planned 2,3,7,8-TCDD Activity" letter to the New Jersey Department of Environmental Protection (Department) from ERM dated 3 September 1999 and a follow-up email dated 24 September 1999. The planned 2,3,7,8-TCDD activity was conditionally approved by the Department on 26 October 1999.

1.1 REMEDIAL ACTION OBJECTIVE FOR 2,3,7,8-TCDD IMPACTED SOILS

The Remedial Action Objectives (RAOs) for the Clifton Facility were developed based on previous investigations and potential risks to the public health, welfare, and the environment posed by the impacted soils. As indicated in the Draft Status Report submitted to the Department on 23 June 1999, the RAO for 2,3,7,8-TCDD impacted soils at the Facility is the removal of 2,3,7,8-TCDD impacted soils having concentrations greater than 2 parts per billion (ppb) in the 0 to 12 foot soil profile. The Electronic Data Deliverable containing the 2,3,7,8-TCDD analytical results will be submitted to the State under separate cover.

1.2 INVESTIGATION FINDINGS AND DELINEATION

This section presents the findings of the investigation relative to the 2,3,7,8-TCDD impacted soils at the Facility and details how the extent of impact was delineated. Figures 1 through 4 describe in detail the areas that were proposed to be excavated (ERM letter 3 September 1999). These figures will be included in the final Remedial Action Report as Figures 1 to 4.

Sampling for 2,3,7,8-TCDD was conducted in areas identified as past drum storage areas at the Facility based on aerial photography. In addition, areas of suspected 2,3,7,8-TCDD contamination, which were identified during previous site investigations but could not be sampled due to production operations in the buildings, were sampled. Delineation is described for each of the four buildings/pads within which 2,3,7,8-TCDD was detected including the 60 Pad, Building 93, Building 95, and Building 168/68. Horizontal and vertical extents are defined by soils whose analyses indicate 2,3,7,8-TCDD concentrations below 2 ppb for depth specific intervals. Table 1 presents the 2,3,7,8-TCDD concentrations of soil samples collected at locations where at least one sample depth exceeded 2 ppb. Figures 1 through 4 show the sample locations, results, and proposed excavation areas for each of the four building pads discussed below (ERM letter 3 September 1999).

1.2.1 *60 Pad*

Two areas within the footprint of the 60 Pad were identified as containing soil with concentrations of 2,3,7,8-TCDD greater than 2 ppb (Figure 1, ERM letter 3 September 1999). The first area was located in the vicinity of 60 Pad SB-19; the second, in the vicinity of 60 Pad SB-21. In the vicinity of 60 Pad SB-19, the vertical extent of 2,3,7,8-TCDD was defined by sampling points where 2,3,7,8-TCDD was detected at or below 2 ppb at a depth below where 2,3,7,8-TCDD had been detected above 2 ppb. These sample points included 60 Pad SB-19-01 at a depth of 6.0-6.5′ and 60 Pad SB-19-03 at a depth of 1.5-2.0′. The horizontal extent of 2,3,7,8-TCDD was defined by 60 Pad SB-19-03, 60 Pad SB-19-04, 60 Pad SB-19-06 and 60 Pad SB-19-07 for soils up to a depth of six feet. For soils up to two feet deep in the vicinity of 60 Pad SB-19-03, the horizontal extent was defined by 60 Pad SB-19, 60 Pad SB-19-09, 60 Pad SB-19-10, and by the building foundation at 60 Pad SB-19-08 where auger refusal was initially encountered. During a second attempt at advancing a borehole at 60 Pad SB-19-08, concrete was encountered to a depth of four feet. In the vicinity of 60 Pad SB-21, the vertical extent of 2,3,7,8-TCDD was defined by 60 Pad SB-19 at a depth of 12.0-12.5′ and by 60 Pad SB-21-04 at a depth of 8.0-10.0′. The horizontal extent of 2,3,7,8-TCDD was defined by 60 Pad SB-21-01, 60 Pad SB-21-02, 60 Pad SB-21-03, and 60 Pad SB-21-08. The following table identifies the sample locations that delineated the extent of excavation.

Depth of Excavation	Sample Locations Delineating Extent of Excavation
0-2′	SB-19; SB-19-08; SB-19-09; SB-19-10
0-6′	SB-19-03; SB-19-04; SB-19-06; SB-19-07
0-8′	SB-21-01; SB-21-03; SB-21-04; SB-21-08
0-12′	SB-21-01; SB-21-02; SB-21-03; SB-21-04

1.2.2 *Building 93*

Two areas within the footprint of Building 93 were identified as containing greater than 2 ppb 2,3,7,8-TCDD (Figure 2, ERM letter 3 September 1999). One area was focused around SB 93-1/1A and the other around SB 93-3. The vertical extent of 2,3,7,8-TCDD was defined by depth intervals of 5.0-6.0′ and 6.0-8.0′, respectively. Similarly, the horizontal extent around SB 93-1/1A was defined by SB 93-1-1, SB 93-1-2, SB 93-1-3, and SB 93-1-4. The horizontal extent around SB 93-3 was defined by SB 93-3-1, SB 93-3-2, SB 93-3-3, and SB 93-3-4. The following table identifies the sample locations that delineated the extent of excavation.

Depth of Excavation	Sample Locations Delineating Extent of Excavation
0-5′	SB 93-1-1; SB 93-1-2; SB 93-1-3; SB 93-1-4
0-6′	SB 93-3-1; SB 93-3-2; SB 93-3-3; SB 93-3-4

1.2.3 *Building 95*

Within the footprint of Building 95, soil having concentrations greater than 2 ppb of 2,3,7,8-TCDD was found in the vicinity of SB 95-8 (Figure 3, ERM letter 3 September 1999). The vertical extent of 2,3,7,8-TCDD beyond 12 feet was defined by SB 95-8 at a depth of 15-16′. As indicated on Figure 3, the horizontal extent of 2,3,7,8-TCDD was defined, in part, by SB 95-8-1, SB 95-8-2, SB 95-8-9, SB 95-8-10, SB 95-8-13, SB 95-8-15, and SB 95-8-18. The following table identifies the sample locations that delineated the extent of excavation.

Depth of Excavation	Sample Locations Delineating Extent of Excavation
0-2′	SB 95-8; SB 95-8-2; SB 95-8-4; SB 95-8-9; SB 95-8-13; SB 95-8-15; SB 95-8-18
0-6′	SB 95-8-4; SB 95-8-5; SB 95-8-10; SB 95-8-13
0-12′	SB 95-8; SB 95-8-4; SB 95-8-5; SB 95-8-10
6-12′	SB 95-8; SB 95-8-1; SB 95-8-2; SB 95-8-3; SB 95-8-4; SB 95-8-10

1.2.4 *Building 168/68*

Within the footprint of Building 168/68, 2,3,7,8-TCDD was detected at a concentration greater than 2 ppb at SB 168-07 (Figure 4, ERM letter 3 September 1999). The vertical extent of 2,3,7,8-TCDD was defined by a depth interval of 5.0-6.0'. The horizontal extent was defined by sample locations SB 168-07-01, SB 168-07-02, SB 168-07-03, and SB 168-07-04. The following table identifies the sample locations that delineated the extent of excavation.

Depth of Excavation	Sample Locations Delineating Extent of Excavation
0-5'	SB 168-07-01; SB 168-07-02; SB 168-07-03; SB 168-07-04

2.0 *SCOPE OF REMEDIAL ACTION*

This section details the excavation and disposal of the soils impacted with 2,3,7,8-TCDD. Personal protective equipment and health and safety procedures were followed in accordance with Attachment J of the Health and Safety Plan for the Facility.

2.1 *EXCAVATION*

Six distinct soil areas, as described and delineated above, were impacted with soils containing concentrations greater than 2 ppb of 2,3,7,8-TCDD in the 0 to 12 foot profile, based on existing analytical results presented herein. On, 3 November 1999, the delineation sample locations were re-established in the field by James M. Stewart, Inc. surveyors. The excavation areas were established by spray painting lines between the delineation sample locations to replicate the excavation areas presented in Figures 1 through 4 (ERM letter 3 September 1999). Using the painted delineation, ERM broke the surficial asphalt and concrete along the perimeter of the area to be excavated. A total of 609.6 tons of soil was excavated from the four areas of concern and transported off-site. The following sections describe the excavation of these soils for each of the buildings.

2.1.1 *60 Pad*

Using a Kobelco 200 excavator with a 1 cy bucket (excavator), ERM excavated the two impacted areas in the 60 Pad on 18 November 1999. The first area was located in the vicinity of 60 Pad SB-19; the second, in the vicinity of 60 Pad SB-21. To facilitate excavation, ERM excavated soils within these areas to depth of 7 and 13 feet, respectively. Figure 5 presents 2,3,7,8-TCDD analytical results and the excavated area for the 60 Pad.

2.1.2 *Building 93*

Using the excavator, ERM excavated the two impacted areas in Building 93 on 9 November 1999. The first area was focused around SB 93-1/1A; the second around SB 93-3. To facilitate excavation, ERM excavated soils within these areas to depth of 5 and 6.8 feet bgs, respectively. Figure 6 presents 2,3,7,8-TCDD analytical results and the excavated area for the Building 93 slab.

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2.1.3 *Building 95*

Using the excavator, ERM excavated the impacted area around SB 95-8, between 11 November 1999 and 16 November 1999. To facilitate excavation, ERM excavated soils to depth 13 feet bgs. Figure 7 presents the 2,3,7,8-TCDD analytical results and the excavated area for the Building 95 slab.

2.1.4 *Building 168/68*

Using the excavator, ERM excavated the impacted area around SB 168-07 on 18 November 1999. To facilitate excavation, ERM excavated soils within this area to depth of 5 feet bgs. Figure 8 presents the 2,3,7,8-TCDD analytical results and the excavated area for the Building 168/68 slab.

2.1.5 *Post-Excavation Sampling*

Post-excavation soil samples were not collected because the excavation areas were pre-delineated as described in Section 1.2. Department conditionally accepted the delineation of these areas in their 26 October 1999 letter to ERM (Attachment 1). ERM verified that the excavation extended at a minimum to, if not beyond, the limits of the delineated area presented in Figures 1 through 4 (ERM letter 3 September 1999).

2.2 *DISPOSAL*

Pre-excavation sampling was performed to characterize the soil to be excavated. As part of the investigation, samples collected within the areas identified above had been analyzed for volatiles, semivolatiles, and metals. Figures 1 through 4 (ERM letter 3 September 1999) present soil exceedances other than 2,3,7,8-TCDD for soil samples collected in the proposed excavation areas. Exceedances were determined by screening analytical data against the more stringent of the Residential Direct Contact Soil Cleanup Criteria and the Impact to Groundwater Soil Cleanup Criteria.

For the purpose of characterizing the soils containing greater than 2 ppb of 2,3,7,8-TCDD for disposal, ERM collected two samples for Toxic Compound Leaching Procedure (TCLP) analysis. Based on available analytical data, ERM collected these samples at locations within the proposed excavation areas where TCLP parameters were detected at their highest concentrations. Samples were collected at SB95-8 (5-6') for TCLP semivolatiles and at SB93-1(10-12') for TCLP volatiles and TCLP metals.

No TCLP parameter was detected above the TCLP level for hazardous waste characterization. The results are presented in Table 2.

A total of 609.6 tons of excavated soil was shipped via truck from the site to the Port Arthur Incinerator/Onyx Environmental Services's facility in Port Arthur, Texas. This facility is permitted to receive and handle these soils. Appendix ____ contains the manifest forms and certificates of destruction for the material.

2.3 *BACKFILL*

Using the crushed concrete generated from the on-site demolition activities, the excavated areas were backfilled, compacted, and graded with crushed concrete to support redevelopment of the affected areas. The 10 January 2000 crushed concrete letter report to Department from ERM describes these activities (Attachment 2).

2.4 *PROJECT COSTS*

TO BE PROVIDED IN FINAL

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3.0 SUMMARY

Givaudan has successfully remediated through removal, the soils in the areas containing 2,3,7,8-TCDD at concentrations greater than 2 ppb up to a depth of 12 feet below grade.

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PASSAIC VALLEY SEWERAGE COMMISSION
NEWARK NEW JERSEY

HEAVY METALS SOURCE DETERMINATION STUDY

IN COMPLIANCE WITH OCEAN DUMPING PERMIT
NO. II NJ003 INTERIM SECTION 9(c)

Passaic Valley Sewerage Commissioners

JOSEPH M. KEEGAN	- Chairman
BEN W. GORDON	- Vice Chairman
THOMAS J. CIFELLI	- Commissioner
VINCENT CORRADO	- Commissioner
ROBERT J. DAVENPORT	- Commissioner
RICHARD M. GIACOMARRO	- Commissioner
CHARLES A. LAGOS	- Commissioner
CARMINE T. PERRAPATO	- Executive Director
ROCCO D. RICCI	- Chief Engineer

PHASE II

APRIL 1980

DRAFT

Elson T. Killam Associates, Inc.

Environmental and Hydraulic Engineers

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KLL013748

SUMMARY AND CONCLUSIONS

Two-hundred and sixty heavy metal contributing industries were sampled and analyzed during the course of the Phase II work. Eighty-nine or 34 percent of the industries are located in Newark, Sub-Area 0. Of the 260 metal contributing industries, 113 or 43 percent are of the metal finishing and electroplating category.

During the Phase II work the treatment plant influent was sampled on weekdays (Monday through Friday) over a total of 114 days. It was determined that the mean influent poundages remained the same (within one standard deviation) as the Phase I mean influent values.

As a result of the sampling of the 260 metal contributing industries in comparison to metals quantities documented to be industrial as a result of the Phase I system sampling and mass balance analysis, the study was highly successful in locating industrial cadmium (100%), industrial lead (100%), and industrial mercury (100%); moderately successful in locating industrial chromium (65%), industrial copper (73%), and industrial nickel (56%); and somewhat less successful in locating industrial zinc (37%).

When considering the high degreee of variability of the metals load in the influent, the cumulative Phase II industrial metals load located plus the Phase I baseline falls within a standard deviation of the Phase I treatment plant influent data. This holds true for all metals except nickel and zinc, which fall just outside the range. It may be assumed that all sources of cadmium, chromium, copper, lead, and mercury may have been located. It is possible as previously stated that all sources of nickel and zinc may not have been located. However, these metals are still very close to the range, as they fall just outside one standard deviation.

It was documented that 30 industries within the Passaic Valley service area discharge greater than 1 percent of any particular total metal load. These industries are considered major metal contributors. Their discharges cumulatively comprise an average of 85 to 90 percent of the total located industrial metals load discharged to the Passaic Valley collection system.

Concentrations standards were applied to all the industries as well as the 30 major industries to determine metals remaining in the influent after pretreatment is employed. The concentration standards were evaluated as to their feasibility. It was determined that by utilizing best available technology and applying percent removals to contributing industrial metal loads, greater removals could be achieved than the removals achieved as a result of the categorical standards. It was, therefore, determined that the categorical standards developed by EPA are practical and achievable by existing technology.

When considering the Phase I influent metal poundages, as well as pretreatment to only the 30 major contributors within the Passaic Valley service area, the following metals quantities can be expected to remain in the influent after pretreatment:

METAL	PVSC INFLUENT METALS AFTER PRETREATMENT TO MAJOR CONTRIBUTING INDUS. (lbs/day)		PERCENT INFLUENT METALS REMOVED AS A RESULT OF PRETREAT. TO MAJOR CONTRIB.
	Mean	Range	Mean
Cadmium	23	3 - 43	62%
Chromium	[illegible]	297 - 1183	52%
Copper	[illegible]	263 - 970	39%
Lead	219	41 - 398	88%
Nickel	612	247 - 977	38%
Zinc	4255	1743 - 6767	26%
Mercury	4.3	0.90 - 7.78	96%

By enforcing pretreatment standards upon the major metal contributors within the Passaic Valley service area, the PVSC can reduce their total influent metals load by approximately 60 percent on an average basis. It should be noted that the additional metals removed by employing pretreatment standards on all industries versus major industries only is minimal. No more than 8.5 percent for any particular metal will be removed by enforcing pretreatment standards on the additional 230 industries.

It should also be noted that small quantities of lead remaining, as well as the large quantities of zinc remaining, indicate the variability of the industrial waste discharge on the two consecutive dates of industrial sampling versus the more characteristic 40 Phase I treatment plant influent sampling dates. Therefore, the lead value remaining may be interpreted to be uncharacteristically low, and the zinc value remaining may be interpreted to be uncharacteristically high.

By the addition of Kearny sewage, in the worst case there will be a 8.7 percent increase of nickel to the combined Passaic Valley/Kearny wastewater (after pretreatment).

Furthermore, it is finally recommended that PVSC examine over a longer period of time the 30 major metal contributing industries identified, as well as undertaking an evaluation of organics, generated within the PVSC service area.

PASSAIC VALLEY SEWERAGE COMMISSION - HEAVY METAL SOURCE DETERMINATION
PHASE II INDUSTRIAL CONTRIBUTION
SUB-AREA 4

CONTROL NO.	NAME AND ADDRESS OF INDUSTRY	FLOW MGD	TOTAL CADMIUM LBS/DAY (MG/L)	TOTAL CHROMIUM LBS/DAY (MG/L)	TOTAL COPPER LBS/DAY (MG/L)	TOTAL LEAD LBS/DAY (MG/L)	TOTAL NICKEL LBS/DAY (MG/L)	TOTAL ZINC LBS/DAY (MG/L)	TOTAL ARSENIC LBS/DAY (MG/L)	TOTAL MERCURY LBS/DAY (MG/L)
10	CONSOLIDATED BASES INC. 120 GREYLOCK AVE. BELLEVILLE	0.0001	0.000	0.029	0.001	0.000	0.000	0.001	0.000	0.0000
			(0.022)	(35.000)	(0.847)	(0.250)	(0.223)	(0.638)	(0.002)	(0.004)
25	IDEAL PLATING & POLISHING 681 MAIN ST. BELLEVILLE	0.0290	0.007	0.014	0.694	0.053	0.168	0.123	< 0.000	< 0.0000
			(0.030)	(0.059)	(2.870)	(0.220)	(0.696)	(0.507)	(0.001)	(0.000)
30	WALTER KIDDE & CO. INC. 675 MAIN ST. BELLEVILLE	0.1200	0.053	0.413	0.182	0.069	0.066	0.440	< 0.001	0.0042
			(0.053)	(0.413)	(0.182)	(0.069)	(0.066)	(0.440)	(0.001)	(0.004)
50	MILLER & SON 24 BELLEVILLE AVE. BELLEVILLE	0.0650	0.109	79.147	2.624	0.130	1.138	0.651	< 0.001	0.0250
			(0.201)	(146.000)	(4.840)	(0.240)	(2.100)	(1.200)	(0.001)	(0.046)
55	MODERN METAL INDUSTRIES 112 GREYLOCK AVE. BELLEVILLE	0.0090	0.010	0.088	0.108	0.179	0.077	0.081	< 0.000	0.0137
			(0.128)	(1.170)	(1.440)	(2.380)	(1.020)	(1.080)	(0.001)	(0.182)
60	P. N. C. INC. 681 MAIN ST. BELLEVILLE	0.0070	< 0.000	0.001	0.396	0.018	0.007	0.008	< 0.000	< 0.0000
			(0.005)	(0.013)	(6.780)	(0.314)	(0.120)	(0.136)	(0.001)	(0.000)
80	WALLACE & TIERNAN 25 MAIN ST. BELLEVILLE	0.2600	0.405	0.666	0.525	0.100	0.254	0.935	< 0.002	0.0846
			(0.187)	(0.307)	(0.242)	(0.046)	(0.117)	(0.431)	(0.001)	(0.039)
200	GIVAUDAN CORP. 125 DELAWANNA AVE. CLIFTON	2.2700	1.060	2.026	5.661	17.039	12.116	69.290	< 0.019	0.0947
			(0.056)	(0.107)	(0.299)	(0.900)	(0.640)	(3.660)	(0.001)	(0.005)
320	ROUTE 17 PLATING INC. 112 RIVER RD. CLIFTON	0.0290	0.001	1.417	0.018	0.063	1.993	0.244	< 0.000	0.0018
			(0.006)	(5.860)	(0.075)	(0.259)	(8.240)	(1.010)	(0.001)	(0.008)
890	GOTHAM GRAPHICS 120 PARK AVE. LYNDHURST	0.0060	0.004	0.075	0.062	0.001	0.002	0.008	< 0.000	0.0004
			(0.080)	(1.500)	(1.240)	(0.029)	(0.044)	(0.152)	(0.001)	(0.008)

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16-02-17

PLANS FOR DISCHARGE PREVENTION,

CONTAINMENT AND COUNTERMEASURE (DPCC)

AND DISCHARGE CLEANUP AND REMOVAL (DCR)

Prepard By: William Turetsky
William S. Turetsky
Director Safety &
Environmental Protection

Reviewed By: W L Suydam
William L. Suydam, Jr. I

APRIL 1985

GIVAUDAN CORPORATION
125 DELAWANNA AVENUE
CLIFTON, NEW JERSEY 0701

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-4.7 Facility Drainage and Secondary Containment

Present Drainage System (Drawing #SK-1558)

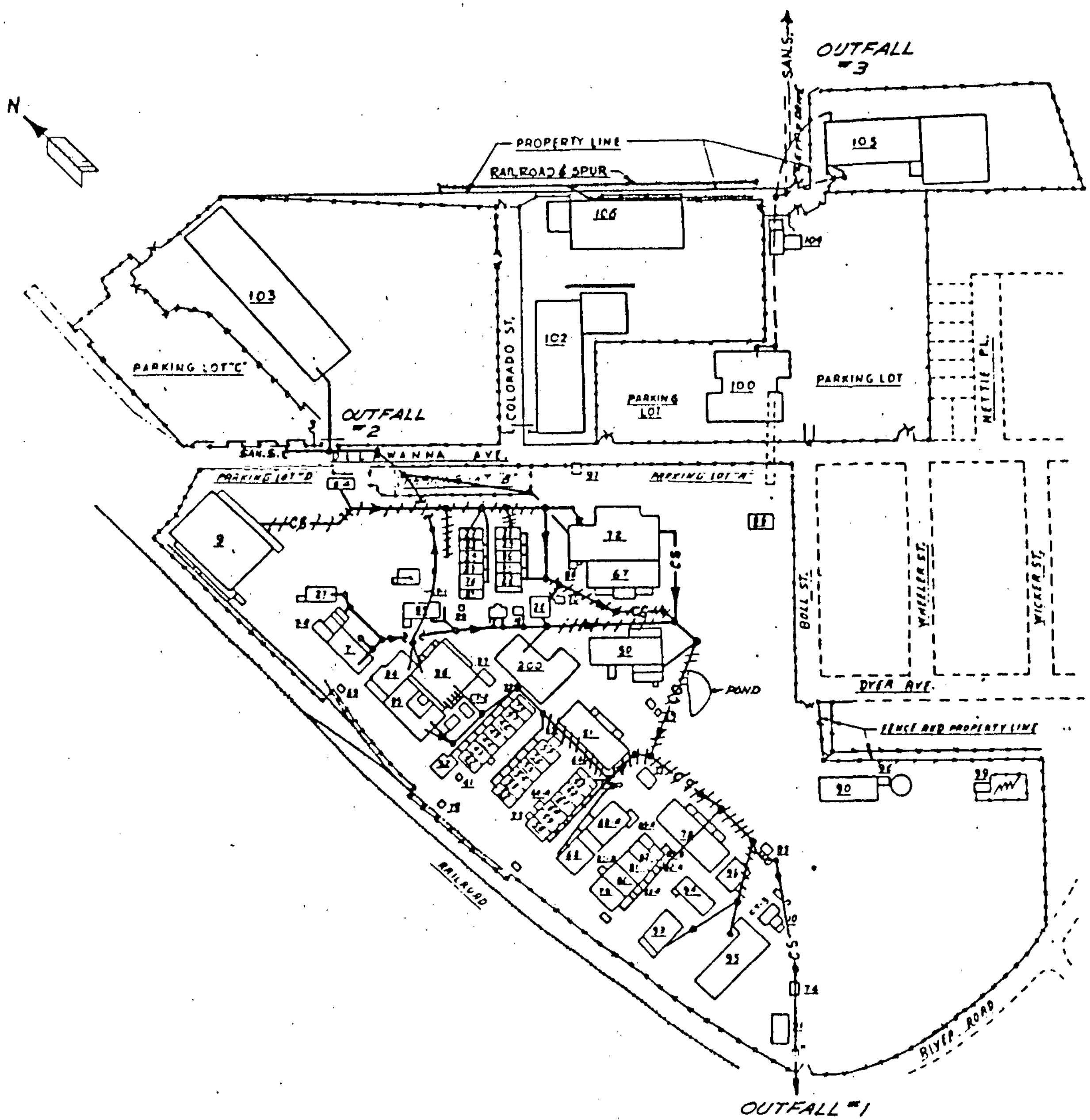
Surface water run-off from the chemical plant is currently discharged to an on-site drainage pond, a gully adjacent to the railroad tracks, the gutter of River Road, and the Passaic River via an existing storm sewer.

Secondary Containment/Diversion Systems
(Drawings #SK-1557, 1559 and 1609)

Givaudan will control future run-off by regrading, repaving, and contructing new curbing on the perimeter of the processing area. Run-off will be directed to a new 150,000 gallon detention basin which will collect the first ¼ inch of rainfall. This run-off will be released to the chemical sewer prior to the next storm. Excess (clean) water will be diverted to the Passaic River via an existing storm sewer. The outfall will be monitored at the frequency specified in our final NJPDES permit.

TO THIRD RIVER

Additional secondary containment facilities include berming of oil tank truck delivery areas, and diking of several storage areas. Storm water which collects in these dikes will be visually inspected. If clean, storm water will be pumped to nearby pavement where it will evaporate or flow to the new detention basin. Contaminants will be removed immediately from the dike. If applicable, free-oils will be removed by employing our portable vacuum spill clean-up system.



SAN. S — SANITARY SEWER

C.S. — CHEMICAL SEWER

ABANDONED

PLANT SEWERAGE

SK-1553-A1

10-11-83
3-21-85

- 103 -

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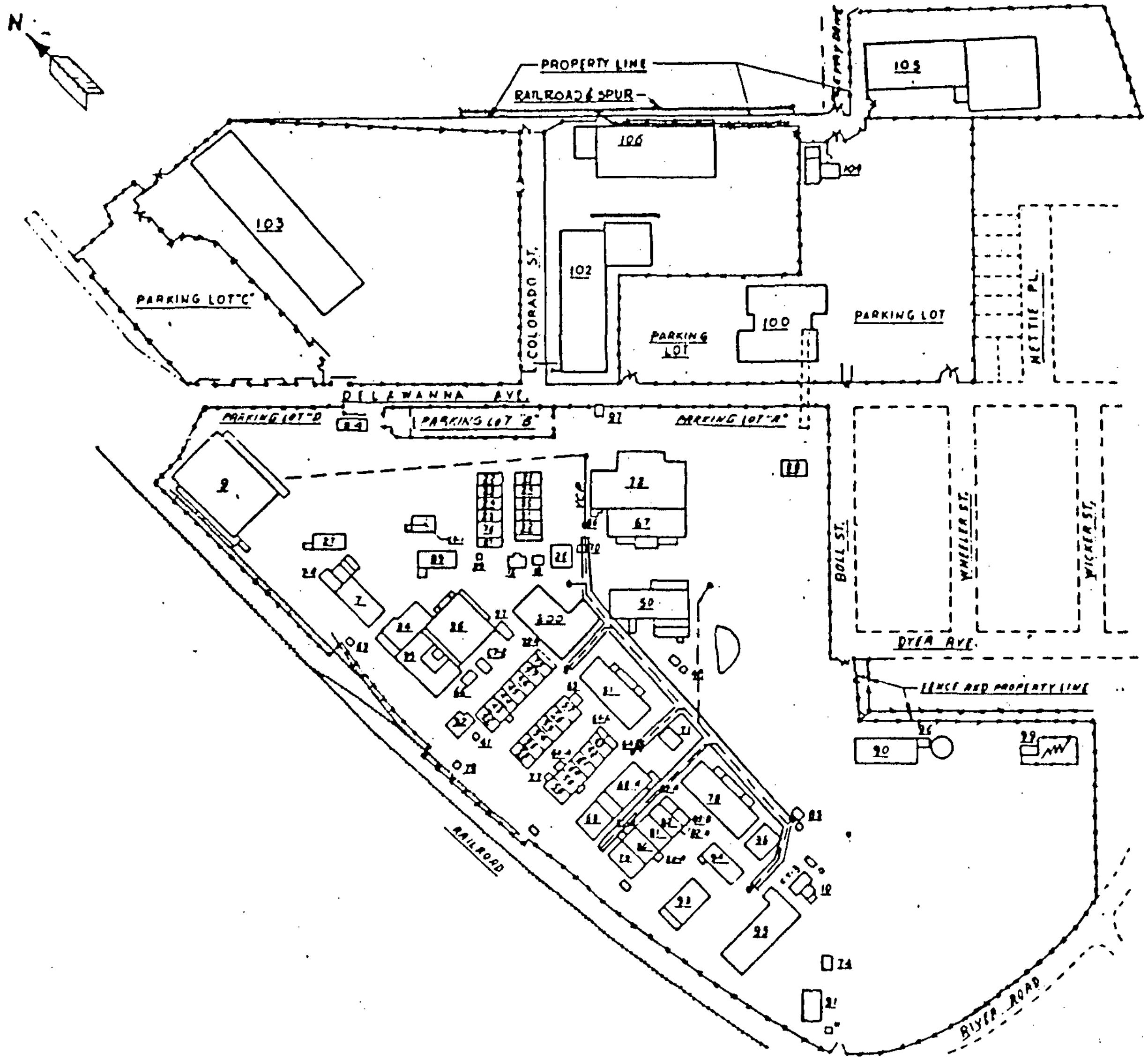


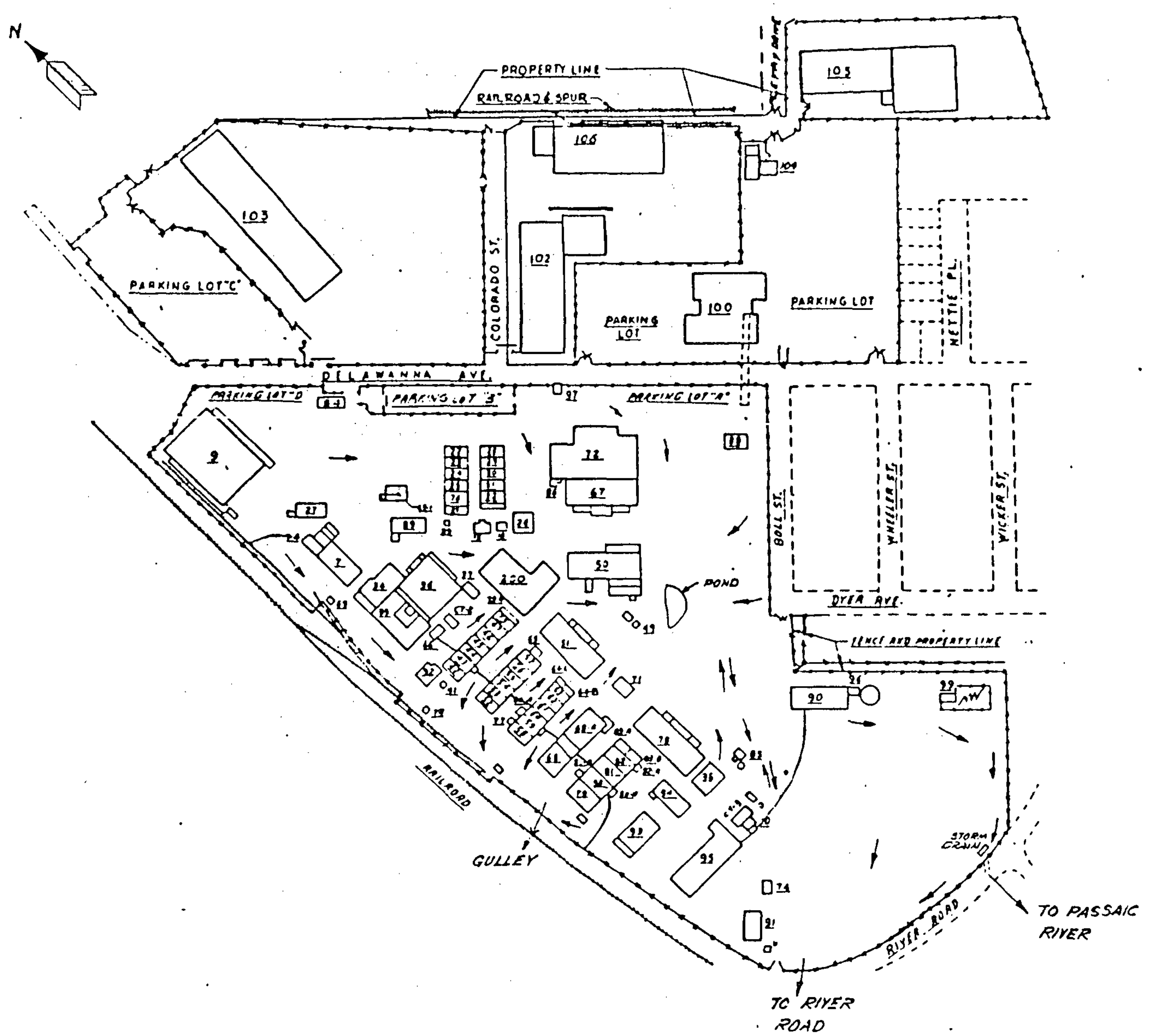
NEW EPOXY LINED FRP SEWER IN CONCRETE TRENC

NEW EPOXY LINED FRP SEWER (BURIED)

PLANT SEWERAGE

SK-1553-A2

3-21-85

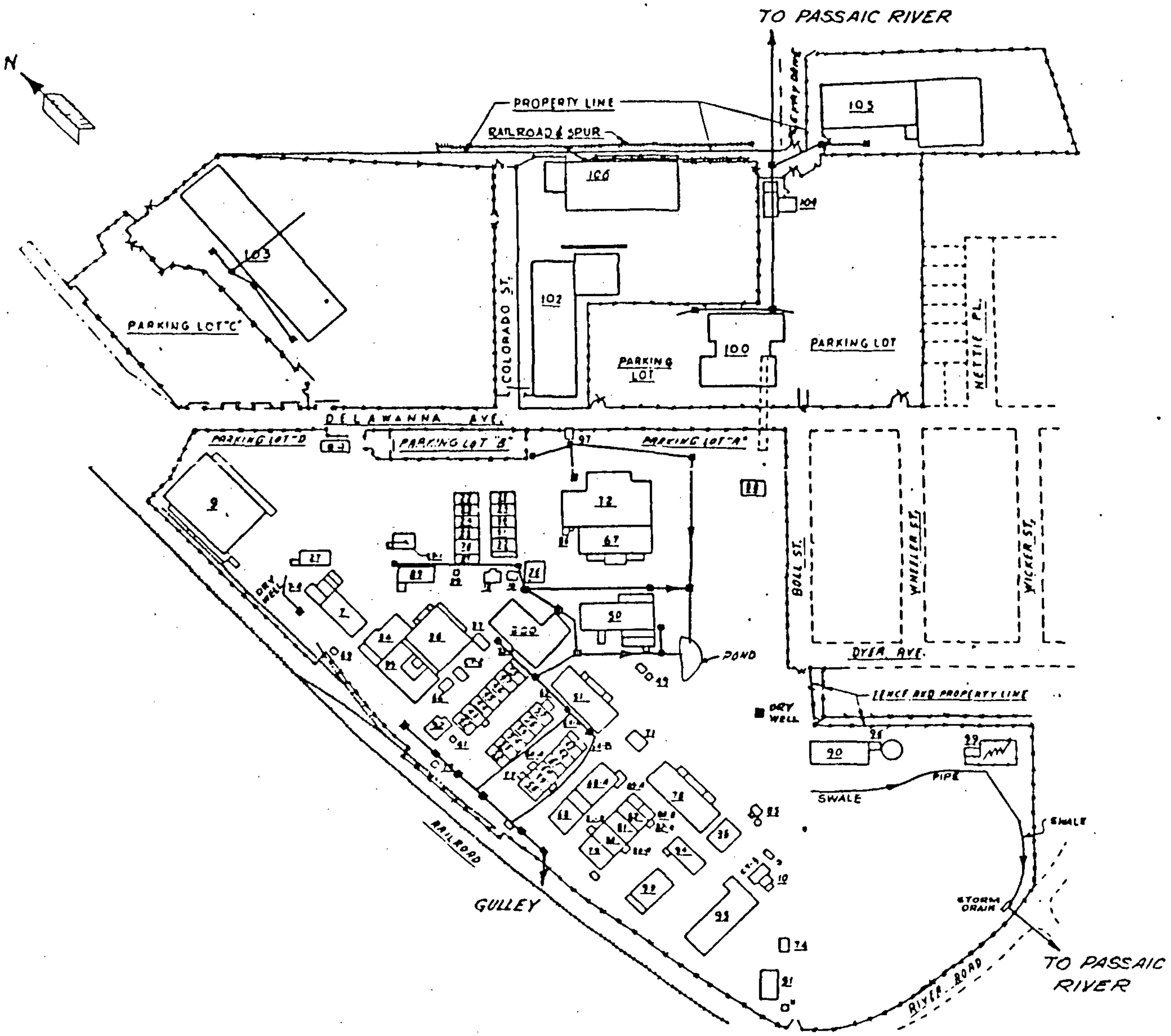


EXISTING DRAINAGE PATTERN

SK-1558

OCT. 12, 1983

932790488

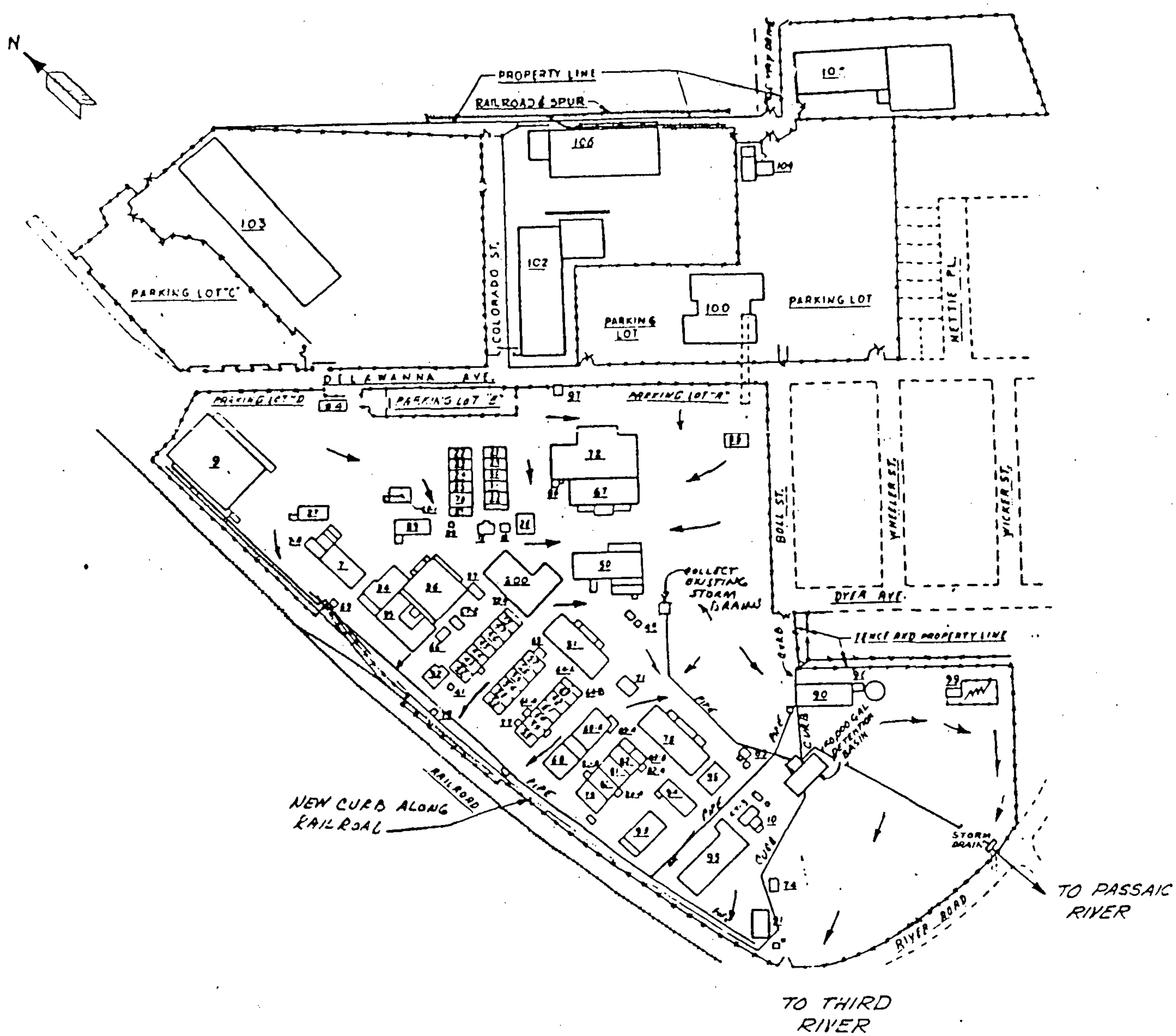


DRAINAGE SYSTEM

SK-1558-B1

OCT. 12, 1983

932790489



FUTURE DRAINAGE PATTERN

SK-1559

OCT. 12, 1983
MAR. 20, 1995

J27

GIVAUDAN CORPORATION

ATTACHMENT I

DETAILS CONCERNING GIVAUDAN'S CONNECTION TO COUNTY STREET SEWER

As discussed with Mr. William Vliet, County Hydraulic Engineer, at an April 13, 1983 meeting at the Clifton plant, plans are underway to rep and curb our existing processing and storage facilities. As indicated on the topographical map provided in Attachment II, drainage waters primarily discharge to a gulley by the railroad tracks and to a small unlined pond. During heavy rainfall, this pond overflows, causing maj flooding throughout the plant.

To eliminate this drainage problem and to comply with New Jersey Depar ment of Environmental Protection (NJDEP) regulations on chemical spill control, we have devised the following action plan:

1. Obtain a Passaic County road opening permit and seek permission to install a new 24" storm sewer as shown in the sketch.
2. If applicable, submit application for a NJPDES permit for the outfall.
3. After the NJDEP issues the above permit, notify the County Enginee and install the aforementioned storm sewer.
4. Pave, regrade, and install new curbing to effectively drain storm water to a new 150,000 gallon retention basin near Building 95 (see sketch).
5. Collect the first one-quarter inch (1/4") of rainfall in this new basin and divert the excess (clean) water to the new storm sewer at a median maximum flow rate of 10,000 gallons per minute.
6. Pump the first 1/4" of rainfall to the Passaic Valley Sewerage Commission (PVSC).

With respect to Item 1. above, other options involving discharge of uncontaminated water to a nearby state DOT sewer and discharge to the PVSC were also explored. However, these two (2) options were rejected for the reasons set forth below. Basis storm sewer maps provided by the New Jersey Department of Transportation, we determined that the DOT sewer cannot handle our storm water run-off (e.g., 10,000 gallons per minute from 30 acres at one inch/hour median maximum rainfall).

Attachment I

Details Concerning Givaudan's Connection to County Street Sewer

Likewise, current PVSC and N.J. Department of Community Affairs regulations prohibit discharge of clean water to the public sewer. Unfortunately, our efforts to obtain variances from these regulations were unsuccessful. (Additional information regarding DOT storm water removal capacity and our variance requests are available upon request.)

With respect to Item 5. above, our calculations indicate the capacity of the County Street Sewer is sufficient to handle peak hourly rainfall (See Table I).

With respect to Item 2. above, please note that we are not proposing a new outfall. As indicated in Attachment II, the new sewer line would carry storm drainage which presently flows down the gutter of River Road and which reaches existing catch basins near the Oak Street intersection.

WST:lk
4/28/83

GIVAUDAN CORPORATION

TABLE I

STORM WATER

Design Basis

Q = flow (gal. per minute)   C = Discharge coeff. = 0.90 (paved areas)

I = 1"/hour rainfall   = 0.10-0.30 (unpaved open lots)

(A) Existing Drainage to 24" Ø Passaic County Storm Water line to Third River

Road (AB)	= (800') (35') (0.90)	= 28,000 $ft.^2$
Road (BC)	= (1,000') (40') (0.90)	= 36,000
Road (BD)	= (700') (40') (0.90)	= 25,200
Road (EF)	= (500') (24') (0.90)	= 10,800
$(AB)_1$	= (800') (100') (0.20)	= 16,000
$(BC)_1$	= (1,000') (100') (0.20)	= 20,000
$(EF)_1$	= (500') (50') (0.20)	= 5,000
$(BD)_1$	= (700') (50') (0.20)	= 7,000
		=148,000 $ft.^2$

$$Q = (148{,}000\ ft.^2)\left(\frac{1''/hr.}{12''/ft.}\right)\left(\frac{7.48\ gal.}{ft.^3}\right)\left(\frac{Hour}{60\ min.}\right) = 1{,}540\ gpm.$$

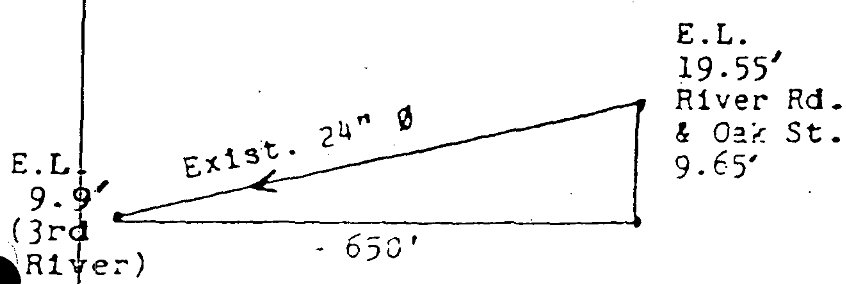
(B) Givaudan Storm Water Run-off (24 acres - Paved area/6 acres - unpaved

$$Q = (24\ acres)\left(\frac{43{,}560\ ft.^2}{acre}\right)\left(\frac{1}{12}\right)\left(\frac{7.48}{60}\right)(0.90) = 9{,}780\ gpm.$$

$$Q = (6\ acres)\left(\frac{43{,}560\ ft.^2}{acre}\right)\left(\frac{1}{12}\right)\left(\frac{7.48}{60}\right)(0.1) = \underline{245}\ gpm$$

10,025 gpm Total

(C) Capacity of Existing 24" R.C. County Storm Water Line to 3rd River from charts based on Manning Formula with pipe running full.



$s = \frac{9.65'}{650'} = 1.48'/100' = 0.0148$

m = 0.013

Q > 12,000 gpm

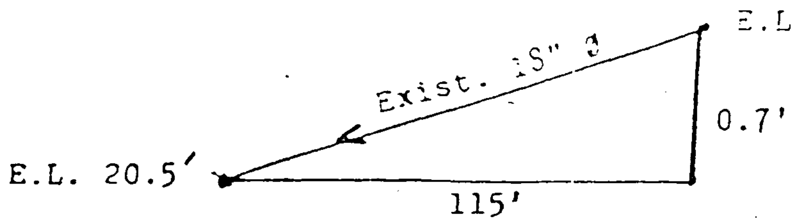
(24" Ø & C=100 old pipe)

932790494

Table I

Storm Water

(D) Existing 18" Ø R.C. Storm Water Line in River Road



$s = \frac{.07}{115} = .006$

$m = 0.013$

Q > 3,000 gpm (capacity of existing 18" Ø).
Existing 18" Ø will not handle Givaudan's run-off flow of 10,000 gpm.

Calculations Performed By: W. Borell

Calculations Reviewed By: W.L. Suydam, P.E.

:lk
4/28/83

932790495

ATTACHMENT II

SUPPLEMENTAL INFORMATION REQUIRED BY SECTION 10.3(a)
NJPDES PERMIT REGULATIONS

1. Name and Location of Facility and Type of Waste to be Discharged:

   Givaudan Corporation, 125 Delawanna Avenue, Clifton, N.J.

   Uncontaminated Storm Water

2. Proposed Start-up Date for New Source:

   N/A - Storm Water is currently discharged to Third River via existing storm sewer. Effective 11/83, total volume will increase due to paving and regrading.

3. Outfall Location: See ATTACHMENT I.

4. Line Drawing of water Flow through the facility with water balance, showing operations contributing waste water to the effluent and treatment units:

   N/A - Only storm water will be discharged through outfall.

5. Acres of land drained, run-off coefficient, and calculated flow based on a 10 year storm frequency:

   See ATTACHMENT V

6. Description of Intermittent Flows:

   Discharge is due to rain runoff which will be extremely variable. The first 1/4" of rain fall will be collected in a lined retention basin and will be discharged to the Passaic Valley Sewerage Commissior Excess rain fall (> 1/4") will be discharged to the Third River.

7. Maximum Production:

   N/A - Applicable effluent guidelines have not been promulgated.

8. Improvements:

   See ATTACHMENT III, DPCC/DCR Compliance Schedule.

932790496

Attachment II

Supplemental Information Required by Section 10.3(a)
NJPDES Permit Regulations

9. Effluent Characteristics:

No data is available.

10. Small Business Exemption:

N/A

11. Used or Manufactured Toxics:

See ATTACHMENT IV

12. Potential Discharges:

We do not expect to discharge any contaminants to the Third River.

13. Biological Toxicity Tests:

No data is available.

14. Contract Analyses:

N/A

GIVAUDAN CORPORATION

William S. Turetsky
May 6, 1983

ATTACHMENT III

DPCC TIMETABLE FOR IMPLEMENTATION

1.	7.1E 4.7	Effluent Treatment Facility	July 1983
2.	7.1E 4.14	Leak Testing of Underground Storage Tanks	
		- Toluene and Ethylene Dichloride Tanks	December 1983
		- Other Tanks	June 1984
3.	7.1E 4.7	Installation of Storm Sewer and Diversion Basin	
		- Submit application for tie-in to County Street Sewer	May 1983
		- Submit NJPDES Permit Application	June 1983
		- Install new Storm Sewer and Diversion Basin	June 1984
4.	7.1E 4.14 and 7.1E 4.16	Installation of Impervious covering	
		- Rear of Plant	November 1983
		- Front of Plant	June 1984
5.	7.1E 4.14	Installation of Diking	
		- Rear of Plant	December 1983
		- Front of Plant	June 1984

:lk

932790498

ATTACHMENT IV

TOXIC POLLUTANTS - Section 307(a), Clean Water Act

Compound Name	EXISTING Raw Mat.	FUTURE Raw Mat.
Acrolein	X	X
Carbon Tetrachloride (Tetrachloromethane)	X	X
2-Chloronaphthalene	X	X
Chlorinated phenols (other than those listed elsewhere; includes trichlorophenols and chlorinated cresols)	X	X
Chloroform (trichloromethane)	X	X
1,2-dichlorobenzene	X	X
1,4-dichlorobenzene	X	X
2,4-dichlorophenol	X	X
Isophorone	X	X
Napthalene	X	X
Diethylphthalate	x	x
Dimethylphthalate	X	X
Toluene	X	X
Trichloroethylene	X	X
Nickel (Total) (5 salts)	X	X
Methyl chloride	X	X
Cyanide	X	X
1,2-dichloroethane	X	X

ATTACHMENT V

GIVAUDAN CORPORATION
125 Delawanna Avenue
Clifton, New Jersey 07014
Phone (201) 546-8000
Cable Givaudanco, Clifton
Telex 133301

May 10, 1983

Passaic County Planning Department
County Administration Building
317 Pennsylvania Avenue
Paterson, N.J. 07503

Attention: Ms. Elizabeth Newton

Subject: Application for Connection to County Storm Drain System

Dear Ms. Newton:

I, the undersigned, in my capacity as Vice President of Givaudan Corporation hereby submit formal application for a road opening permit and for a proposed connection to the existing River Road storm drain system in Clifton, New Jersey. The enclosed sketch and attachments provide further details regarding this project.

I hereby agree to defray the entire cost of this operation, together with the cost to the County, of any replacements or repairs.

I also agree to assume all responsibilities for the work and for any damage or injury which may result from this installation and during the maintenance thereof.

Very truly yours,

GIVAUDAN CORPORATION

Mr. John Rankin
Vice President

CIVAUDAN
CORPORATION

SUMMARY AR-1

Division	Location/Dept.	AR-1 No./Type	Date
emical Plant	Sewer Station, 85-72	0-782	July 15, 1982

Project Title	Project Life	
INTERIM NEUTRALIZATION ATION - EXPANSION	25 years	Starting Date 7/19 Completion Date 12/3

Type of Request (Check one)

Green X   Partial Green___   Yellow___   Supplementary to:___

Type of Project (Check only one)

Expansion___   Cost Reduction___   Replacement___   Other (Specify)(X) Government Compliance

DESCRIPTION AND RATIONALE:

The present waste water treatment system is not sufficient to bring our sewer effluent in compliance with PVSC (Passaic Valley Sewerage Commission) regulations. As a result we are out of compliance with the pH (between 5 and 9) of our effluent, and the discharge of oil and grease over 100 mg/l. This proposed treatment system should bring us into compliance with the above standards.

(See accompanying memo of 6/25/82.)

	Capital/Expense	
000-199	Land	
100-199	Land Improvements	
200-299	Buildings	
300-499	Machinery and Equip.	$ 68,000
500-599	Installations	75,000
600-699	Furniture & Fixtures	
700-799	Office Mach. & Equip.	
800-899	Vehicles	
900-999	Other (Specify)	
	Total Capital	$ 143,000
	Assoc. Exp.	15,000
	Total Requested	$ 158,000
	Previously Authorized	---
	Future Requirements	---
	Total Project	$ 158,000

Economic Justification:

Risk Class___   DCFR___

Payback___

Originated By: P. Strebinger PCS

Engineer: R.K. Kuhn RK

Approvals/Reviewed: Date:

Signature	Title	Date
PCS	Plant Eng. Mgr.	7/.
	Safety Manager	7-1
	Dir. Environmental	7/
K.T.O.	Dir. Plant Chemistry	7/
	Dir. Plant Admin.	7/
	Dir. & Gen. Mgr.	7/2
	V.P. Finance	7/2
F. Schenk	Executive V.P.	7-

O.K. TO PROCEED 8/3/82

Distribution cc: P. Strebinger, R. Kuhn, P. Doucette, W. Turetsky, K. Aspinwall, G. Stregg

932790501

AR-1 (Rev 1 1 July 1981)

To: P. Gross

Div.

Subj: INTERIM EFFLUENT SEWER TREATMENT PLANT

From: G. F. Talarico

Copies for: P. Strebinger

It is practically impossible to sustain the pH of our plant waste water effluent in the 5 to 9 range, prescribed by law, because our present system does not permit adequate neutralization or sufficient retention time of the flow. Passaic Valley Sewerage Commissioners are aware of our excursion from the required pH range and have been after us since 1978 when they discovered that the effluent from our plant caused the corrosion of the sewer line over the Third River. We promised that we would do something about the problem; as a matter of fact in our application for the sewer connection permit, we gave P.V.S.C. a tentative compliance schedule for the design and construction of an effluent treatment plant. This was done in a letter written on February 13, 1981 by K. Aspinwall where we informed them that an effluent treatment plant would be completed in May 1983. Since it is apparent that we are not going ahead with this project at this time, we must come up with an alternative plan or we could seriously damage our excellent relationship with the P.V.S.C.

This entire sewer treatment situation is further aggravated by a new proposed pretreatment standard from P.V.S.C. for flammable materials which specifies that if the lower explosion limit exceeds 40% of the absolute value for more than 10 minutes or the discharge exceeds 60% of the absolute value, we must isolate and stop the discharge, ceasing operations if required. This means that along with our interim effluent treatment facility, we must include a diversion basin to be able to divert the stream in order to take corrective steps, if necessary. Such a basin could very easily be part of our storm water and spill collection system which we plan to install.

GFT/rd

George T

932790502

GIVAUDAN CORPORATION

P. C. Strebinger
Clifton, N. J. 07014
July 14, 1982

AR O-782

WASTE WATER TREATMENT PLANT EXPANSION

PROJECT:

Install additional neutralization capacity, screens and oil skimmer in order to properly treat our waste water effluent.

COST:

$ 158,000

PRESENT SITUATION:

We are attempting to neutralize far more acid than the system was designed to do. There is only approximately 10 min. retention time in the system which is insufficient to achieve proper mixing. The present screens are in the wrong place and there is no facility to remove entrained oil.

PROPOSED INSTALLATION:

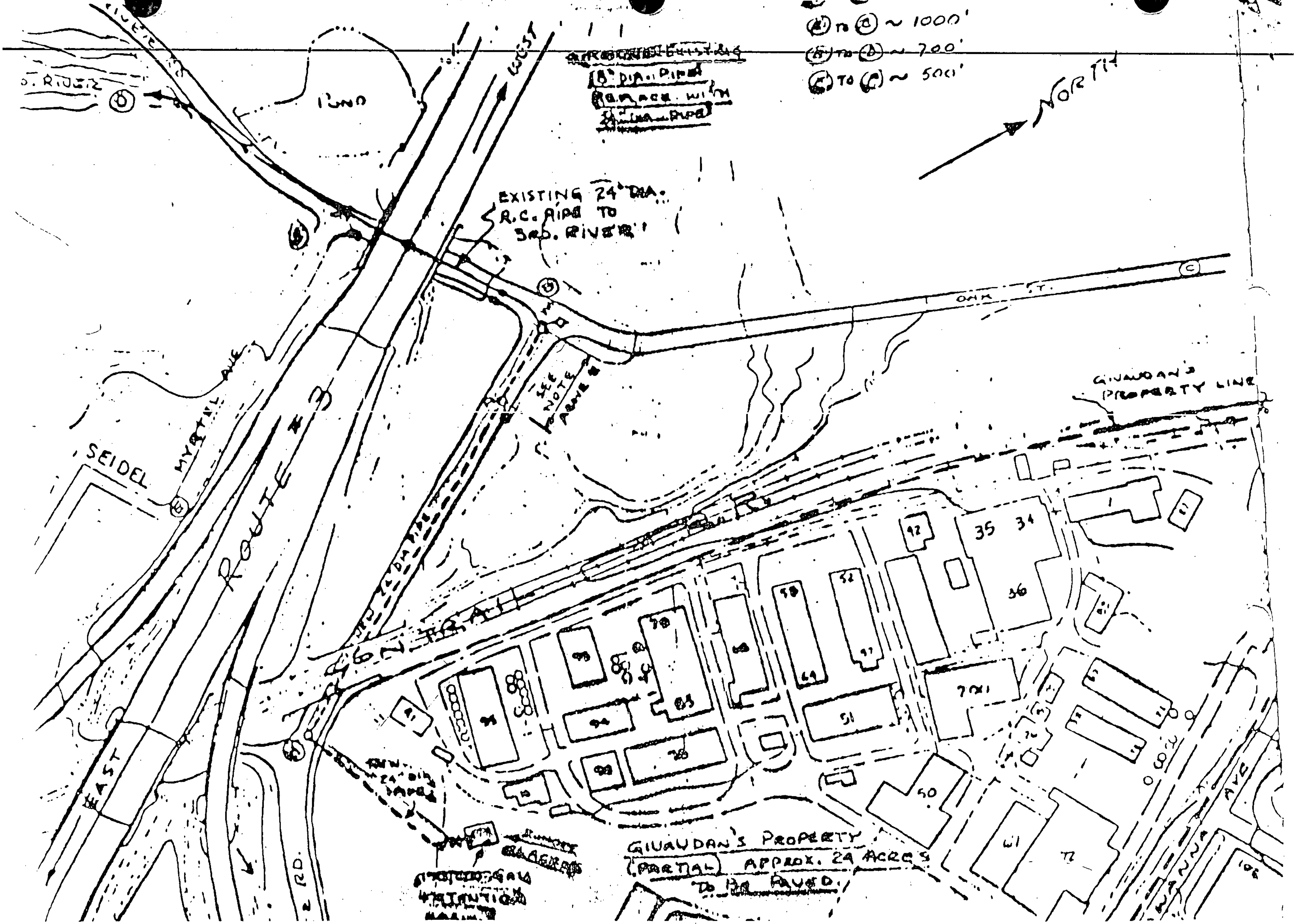
We will install additional retention capacity in order to properly neutralize the effluent. A new pit will be constructed to house the screens and skimmer. Proper pumps and agitators will be installed. Improved instrumentation will facilitate better control.

JUSTIFICATION:

Sewer effluent from present system does not meet PVSC (Passaic Valley Sewerage Commission) compliance standards in terms of pH, oil and grease.

PCS:jmb

932790504



(A) TO (B) ~ 1000'
(B) TO (D) ~ 700'
(C) TO (D) ~ 500'
NORTH
POND
WEST
EXISTING 24" DIA. R.C. PIPE TO 3RD. RIVER
OAK ST.
SEE NOTE ABOVE
GIVAUDAN'S PROPERTY LINE
SEIDEL
MYRTLE AVE
ROUTE #3
EAST
35
34
36
51
50
GIVAUDAN'S PROPERTY (PARTIAL) APPROX. 24 ACRES TO BE PAVED.

J28

932790505

GIVAUDAN

April 25, 1991

Mr. Nicholas Eisenhauer, Case Manager
State of New Jersey,
Dept. of Environmental Protection
Div. of Hazardous Waste Management
401 East State Street, CN 028
Trenton, NJ 08625

MAY - 7

Subject: NJDEP March 21, 1991 Letter

Dear Mr. Eisenhauer:

On behalf of the Givaudan Corporation, I would like to thank you and the other members of your staff for your consideration of our proposal to review the clean-up levels which may be applicable to the Givaudan site.

The following is in response to your March 21, 1991 letter and will be addressed, by topic, as listed in the letter.

A.1 The future use of the Givaudan "Site", ("Site" being defined in the 3 March 1987 Administrative Consent Order TCDD as the "chemical manufacturing facility located to the south of Delawanna Avenue, at 125 Delawanna Avenue (Block 73-3, Lot 2)") will remain as commercial/industrial.

The appropriate provisions will be made to insure the non-residential status when this matter is addressed in the Feasibility Study.

A.2 Two copies each of Drawings A9708, Rev. L, Rev. M, Rev. N and A9565, Rev. 9 are enclosed along with Tables 1 and 2 listing the sample identification, sample depth, and 2,3,7,8-TCDD (TCDD) concentrations for those locations where TCDD levels in excess of 7.0 ppb were detected.

Drawing A9708, Rev. L
Contaminated Non-Process Area:
Sample Locations with 2,3,7,8-TCDD
concentrations between 7 and 20 ppb.

Drawing A9708, Rev. M
Contaminated Non-Process Area:
Sample Locations with 2,3,7,8-TCDD
concentrations greater than 20 ppb.

Drawing A9708, Rev. N
Contaminated Non-Process Area:
All Sample Locations with 2,3,7,8-TCDD
concentrations above 7 ppb.

932790506

GIVAUDAN CORPORATION
Delawanna Avenue Clifton, New Jersey 07015-5034 Telephone 201/365-8000 Telex 219259

GIVAUDAN CORPORATION

Drawing A9565, Rev. 9
Contaminated Process Area:
All Sample Locations with 2,3,7,8-TCDD concentrations above 7.0 ppb.

Tables 1 and 2 are enclosed.

Table 1: All Sampling Locations with 2,3,7,8-TCDD concentrations above 7.0 ppb.

Table 2: All Sampling Locations with 2,3,7,8-TCDD present in excess of 7.0 ppb (in ascending concentration order).

A 3 The volume of soil with 2,3,7,8-TCDD concentrations in the Contaminated Process and Contaminated Non-Process areas in excess of 7.0 ppb 2,3,7,8-TCDD has been estimated to be 900 cu. yds.

The volume of soil with 2,3,7,8-TCDD concentrations above 20 ppb in the Contaminated Process and Contaminated Non-Process areas has been estimated to be 510 cu. yds.

The derivation of approximating these values is found in Table 3.

A 4 Givaudan sponsored treatability research projects.

Enclosed is a copy of a March 28, 1991 report outlining the status of the projects.

B As previously indicated, our consultants, Environmental Resource Management, Inc. (ERM) indicated that a CERCLA format feasibility study would be more comprehensive than the ACO format. However, at NJDEP's request, the feasibility study will be formatted as per the 5 March 1987 ACO.

I trust you will find this information in order. If you have any questions or require further information, please feel free to contact me.

Thank you again for your cooperation in this matter.

Sincerely,

GIVAUDAN CORPORATION

L. A. Levy
Director, Quality Assurance

Table 1

SAMPLE LOCATIONS
2,3,7,8 TCDD >7.0 PPB

GIV ID.	SPL. DATE	TYPE/ORIGIN	TCDD (PPB)
"D"	83/06/10	SURFACE/NORTH OF BLDG 58 (BETWEEN 58 & 59)	11.00
05-LL	88/11/19	10-12" SOIL WAFER	12.00
15-LL	88/11/19	00-02" SURFACE SOIL	11.00
32-LI	90/04/07	00-01" SURFACE SOIL	9.40
35-LL	88/11/19	00-02" SURFACE SOIL	11.00
79-LI	90/04/08	10-12" SOIL WAFER	76.00
80-LI	90/04/08	10-12" SOIL WAFER	18.00
GG-03	83/06/14	00" SURFACE/NE OF BLDG 58 (BETWEEN BLDGS 58 & 59)	9.30
JA013	83/09/12	06-12" DIRT CORE	22.00
JA013	83/09/12	12-18" DIRT CORE	13.00
JA025	83/09/12	00-06" DIRT CORE	13.00
JA025	83/09/12	06-12" DIRT CORE	8.80
JA025	83/09/12	12-18" DIRT CORE	9.10
JA027	83/09/12	00-06" DIRT CORE	9.60
JA027	83/09/12	06-12" DIRT CORE	7.50
L-23	84/07/30	00-02" SURFACE SOIL	19.97
L-25	84/07/26	10-12" SOIL WAFER	9.95
L-27	84/07/26	10-12" SOIL WAFER	49.56
L-28	84/07/24	00-02" SURFACE SOIL	34.29
L-29	84/07/26	00-02" SURFACE SOIL	7.83
L-30	84/07/26	10-12" SOIL WAFER	25.01
L-31	84/07/24	10-12" SOIL WAFER	8.38
L-37	84/07/26	00-02" SURFACE SOIL	7.46
L-40	84/07/26	10-12" SOIL WAFER	16.89
L-43	84/07/25	04-06" SOIL WAFER	10.12
LL-06	88/05/21	10-12" SOIL WAFER	11.30
LL-08	88/05/21	10-12" SOIL WAFER	15.40
LL-16	88/05/22	10-12" SOIL WAFER	9.40
PA-01	89/03/18	00-06" SOIL	200.00
PA-08-D	89/03/18	00-06" SOIL	16.00

Table 2

SAMPLE LOCATIONS >7.0 PPB TCDD
TABULATED IN ASCENDING ORDER

GIV ID.	SPL. DATE	TYPE/ORIGIN	TCDD (PPB)
L-37	84/07/26	00-02" SURFACE SOIL	7.46
JA027	83/09/12	06-12" DIRT CORE	7.50
L-29	84/07/26	00-02" SURFACE SOIL	7.83
L-31	84/07/24	10-12" SOIL WAFER	8.38
JA025	83/09/12	06-12" DIRT CORE	8.80
JA025	83/09/12	12-18" DIRT CORE	9.10
GG-03	83/06/14	00" SURFACE/NE OF BLDG 58 (BETWEEN BLDGS 58 & 59)	9.30
32-LI	90/04/07	00-01" SURFACE SOIL	9.40
LL-16	88/05/22	10-12" SOIL WAFER	9.40
JA027	83/09/12	00-06" DIRT CORE	9.60
L-25	84/07/26	10-12" SOIL WAFER	9.95
L-43	84/07/25	04-06" SOIL WAFER	10.12
"D"	83/06/10	SURFACE/NORTH OF BLDG 58 (BETWEEN 58 & 59)	11.00
15-LL	88/11/19	00-02" SURFACE SOIL	11.00
35-LL	88/11/19	00-02" SURFACE SOIL	11.00
LL-06	88/05/21	10-12" SOIL WAFER	11.30
05-LL	88/11/19	10-12" SOIL WAFER	12.00
JA013	83/09/12	12-18" DIRT CORE	13.00
JA025	83/09/12	00-06" DIRT CORE	13.00
LL-08	88/05/21	10-12" SOIL WAFER	15.40
PA-08-D	89/03/18	00-06" SOIL	16.00
L-40	84/07/26	10-12" SOIL WAFER	16.89
80-LI	90/04/08	10-12" SOIL WAFER	18.00
L-23	84/07/30	00-02" SURFACE SOIL	19.97
JA013	83/09/12	06-12" DIRT CORE	22.00
L-30	84/07/26	10-12" SOIL WAFER	25.01
L-28	84/07/24	00-02" SURFACE SOIL	34.29
L-27	84/07/26	10-12" SOIL WAFER	49.56
79-LI	90/04/08	10-12" SOIL WAFER	76.00
PA-01	89/03/18	00-06" SOIL	200.00

TABLE 3

Derivation of Volumes of Soil

Assumption 1: Depths of contamination have been calculated to 2 ft. maximum. (All sampling results indicate that TCDD has not been detected at levels below 2 ft.

Assumption 2: The areas estimated radiate from the sampling location outward to a sampling location of lesser concentration.

Above 20 ppb

Contaminated Process Area:

Sample Location	Cu. Ft.	Cu. Yds.
PA-01	ca. 159	ca. 6

Contaminated Non-Process Area:

Sample Location	Cu. Ft.	Cu. Yds.
JA-013 (20 x 40 ft. approx.)	ca. 1,600	ca. 60
79-LI (If the hot spot were excavated to a radius of 10 ft., 79-LI would be reduced from a 3,000 cu. ft. to 620 cu. ft.)	ca. 3,000	ca. 111
L-28 (The entire area)	ca. 7,400	ca. 270
L-27 (20 ft. left and right of the location; 20 ft. to the north)	ca. 1,600	ca. 60
TOTAL	**ca. 13,759**	**ca. 510**

Above 7 ppb but less than 20 ppb

Contaminated Process Area

Sample Location	Cu. Ft.	Cu. Yds.
"D"/GG-03	ca. 49	ca. 2
PA-08D (15 ft. radius from location)	ca. 14	ca. 52

Contaminated Non-Process Area:

Sample Location	Cu. Ft.	Cu. Yds.
L-43/JA-013 Area	ca. 1,600	ca. 60
L-37 (15 ft. radius from location)	ca. 706	ca. 27
LL-16/LL-40 (Estimating to 20 ft. east of LL-16)	ca. 3,100	ca. 115
79-LI/80-LI Area	ca. 2,550	ca. 95
L-29/JA-025/L-28 /L-31/L-30 Area	ca. 7,400	ca. 274
05-LL -->76-LL --> 07-LL -->2S-LL	ca. 2,065	ca. 77
32-LI (Isolated Location) (10 ft. radius)	ca. 628	ca. 24
35-LL (10 ft. radius from sampling location)	ca. 628	ca. 24
LL-08 (10 ft. radius)	ca. 628	ca. 24
L-27 (20 ft. left and right; 20 ft. north)	ca. 1,600	ca. 60
L-25 (35 x 25 ft)	ca. 1,750	ca. 65
L23/JA-027	ca. 1,500	ca. 56
TOTAL	**ca. 24,218**	**ca. 900**

Clifton, New Jersey
March 28,1991

TCDD DECONTAMINATION RESEACH PROJECTS

STATUS REPORT

1. **Application of Microwave Technology - Prof.L. Dauerman**

    The pilot work using 9,10-anthraquinone as a model contaminant has been completed. This contaminant was effectively removed and the mass balance was very good.

    Presently the microwave characteristics of uncontaminated Givaudan soil are being assessed and this data will be used to design and conduct microwave experiments on low level TCDD-contaminated soil (i.e.,<1 ppb) .

2. **Anaerobic Biodegradation - Profs. R. Ahlert & D. Kosson**

    A composite sample of uncontaminated Givaudan soil was fractionated and analyzed by the Rutgers Soil Lab. Microorganisms have been screened using 1,1,1-trichloroethane (TCE) as a model halogenated substrate. Promising microorganisms are being enriched and adapted to halogenated aromatics.

tcddproj.rpt

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MEMO

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO EDWIN LIU

FROM DAVE SCHRIER DATE 22 JUN 1983

SUBJECT GIVAUDAN - REVIEW OF FILES

A review of the referenced subject's files indicates the following potentialities for dioxin formation and/or contamination:

8.1.4.10 Application for permit to construct, install or alter control apparatus and equipment, 11-3-70. Concerns removal of solid bed from cartridge type filter inside building #9. Material is decolorizing earth similar to Fuller's earth. Possible air contaminants listed include hexachlorophene, a Class I precursor. Operation takes place at ambient conditions with a 2400 cu.ft./min. volume of discharge gas into open air. Contact person-Haberstroh, project engineer.

8.1.6.7 Application to operate control apparatus or equipment. Spray drying of aqueous slurry of hexachlorophene. 2-9-71. Continuous operation, 24 hrs./day, 5 days/wk. Air contaminant was hexachlorophene, Class I, at 0.36 lbs/hr. Temperature at point of discharge was 190°F. Contact - Haberstroh. Phone - 477-0741. This could have been a significant source of dioxin due to a Class I pesticide at elevated temperature.

8.5.1 p.9 Analyses of inactive and non-contact cooling water wells dated 3-24-83 submitted by Givaudan show 5.3ppb of 2,4-dichlorophenol (class I) in well #7 located near bldg.#91.

8.5.1 p.63 Inspection report dated 6-5-80 by Mike Kramer formerly of BHWC&M states that chlorinated dioxin was being disposed of under manifest, at Interex Corporation, Natick, Mass. Eighty drums per month were being shipped out. Slight leakage in drum storage area was reported with most of drums remaining intact. Report goes on to state that inspector was told that Givaudan was generating and storing PCB's on site. U.S.E.P.A. inspectors have report concerning these practices, according to Kramer.

8.5.1 p.92 Memo from Mr. Delgado, MS&E, DWR, to Acting Director Zelikson, 8-18-78. Stated that samples of effluent discharged to PVSC were taken in May 1978 and showed no dioxin. However, at that time the limit of detection was only 0.1ppm.

8.5.1 p.133 Letter from G. Talarico, Givaudan to Robert Reed, Supervisor, Field Operations Passiac-Hackensack Basin. Failure of sewer line on March 15 and March 21, 1978, located at River Road and Third River Bridge. An undetermined quantity of effluent was discharged into the river. No information concerning dioxin analysis was found in the file although other more common parameters were analyzed from the effluent.

8.3.1 ENG p.1 Part A application shows U132, hexachlorophene, 0.226 metric tons, disposed of under manifest. Ultimate disposal site not known at this time - information available from BHWC&M.

8.3.1 ENG p.2 Part A application shows U230, 2,4,5-trichlorophenol, disposed of under manifest. Disposal site can be determined by BHWC&M.

Dave Schier

DS:aa

cc: Dr. Jorge Berkowitz
Joe Wiley
Scott Santora
Mohamed Elsaady

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J30

932790516

FINAL REPORT

BBF000056

Givaudan Roure Corporation

Remedial Action Report for Sewer Decommissioning *Clifton, New Jersey*

February 2000

22329.00.01

Environmental Resources Management
855 Springdale Drive
Exton, Pennsylvania 19341

932790517

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Givaudan Roure ("Givaudan") has completed extensive remedial activity at their property located at 125 Delawanna Avenue in Clifton, New Jersey. The remedial activity was completed during the plant demolition (1998-1999), to comply with a contractual obligation made with a buyer, Reckson-Morris Operating Partnership, LLP (Reckson-Morris). In the process of excavating the sewers and related features, Givaudan removed a significant amount of soils that contained various compounds in exceedance of applicable New Jersey Department of Environmental Protection (NJDEP) criteria. This document entitled "Remedial Action Report for Sewer Decommissioning (RARSD)" describes the activities and the findings of the completed work scope.

Over 11,000 lineal feet of chemical sewer and storm sewer line, five underground storage tanks, four cesspools, miscellaneous features such as manholes, catch basins, and 15,600 tons of impacted soils were removed from the property to approved off-site disposal facilities. In addition, the stormwater retention pond was taken out of service and underlying soils were removed, and 2,558 tons of asphalt from paved areas in the plant were removed and sent off site for disposal. Soils not suitable for reuse were sent off site for recycling. Concrete from the demolished buildings and various storage pads were crushed, sampled, and reused on site as backfill, and for rough grading of the property.

Post-excavation soil samples were collected in accordance with New Jersey Technical Regulations for Site Investigation, 1997, along the sidewall and bottom of the excavations. Additionally, stockpiled soils, and stockpiled crushed concrete, were sampled and evaluated for reuse in accordance with reuse criteria established with the NJDEP. All materials reused on-site were sampled and determined to be suitable for on-site reuse.

Many areas were excavated until data indicated no exceedance of either the more stringent of the Impact to Ground Water Soil Cleanup Criteria (IGWCSC) and/or the Unrestricted Use Soil Cleanup Criteria (RDCSCC). Not all soils with exceedances were removed, and across the property there remain in place soils that exceed one or more of the applicable NJDEP soil standards. These areas however will be incorporated within a Deed Notice that will be submitted for the project as part of a separate deliverable.

In summary, Givaudan has proactively remediated a substantial portion of the property through active removal, and has prepared it for beneficial reuse.

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1.0 INTRODUCTION

Givaudan Roure Corporation (Givaudan Roure) has prepared the following *Remedial Action Report for Sewer Decommissioning (RARSD)* at Givaudan Roure's 125 Delawanna Avenue, Clifton, New Jersey plant (Facility).

In August 1998, Givaudan Roure ceased production and closed the Facility with the intent of demolishing the buildings and divesting the property. On 8 March 1999, Givaudan Roure executed an Agreement of Sale (Agreement) with Reckson Morris Operating Partnership, LLP (Reckson Morris) for the purpose of transferring ownership of the Facility from Givaudan Roure to Reckson Morris. The Agreement specified removal of certain sewer lines at the Facility.

Three sewer systems existed at the Facility, including chemical (old and new), sanitary, and storm sewers. Givaudan Roure proactively decided to excavate the sewers to identify and remove potential source areas of contamination and minimize future liabilities during construction and redevelopment. Givaudan Roure's primary objective was to excavate as much of the system as possible, given any physical constraints that may exist on the Facility.

Excavation of the sewers started in August 1998 and was completed in April 1999. A total of 11,251 feet of sewer was removed which included 5,751 feet of old chemical sewer, 2,115 feet of new chemical sewer, and 3,385 feet of stormwater sewer. In addition to the sewer systems, the stormwater retention pond was removed, as were miscellaneous features such as manholes, catch basins, cesspools, previously undiscovered underground storage tanks (USTs) and septic tanks. Portions of sewer line not excavated were investigated following the NJDEP Technical Requirements for Site Remediation (Technical Requirements) using soil borings to determine potential impacts along these lines.

The purpose of this report is to provide the NJDEP a detailed summary of the remedial activities, including a discussion of methods, soil management, results and observations, and conclusions.

1.1 *REMEDIAL ACTION OBJECTIVES*

To meet the closure and property transfer objectives as stated above, Givaudan Roure developed the following remedial action objectives for the decommissioning of the sewer systems:

- Remove the old chemical, new chemical, and stormwater underground sewer lines, including any other encountered subsurface features identified to be historical potential source areas.
- Excavate and treat, or recycle soils impacted by the historical operation of the sewer systems.
- Backfill and compact the excavations appropriately in consideration of the future usage of the property.

This report documents the soil remediation activities performed during sewer excavation and decommissioning at the Facility. The following Sections provide an explanation of how the remedial action objectives were satisfied by the completed remedial action for soil.

1.2 *REPORT CONTENT*

This report is divided into eight sections:

- Section 1, Introduction, provides an Introduction and Summary of Objectives;
- Section 2, Background, provides a discussion of the Background of the Facility;
- Section 3, Project Work Scope, provides a summary of the Scope of Work for the sewer excavation/soil remediation activities.
- Section 4, Supplemental Sewer Investigation Methods, provides a description of Supplemental Sewer Investigation Methods. Included in this section are soil boring installation, sampling, and abandonment.
- Section 5, Remedial Action and Investigation Results, provides a summary of Remedial Action/Investigation Results;
- Section 6, Conclusion, provides a List of Findings and Conclusions derived from the sewer removal and soil remediation activities.
- Section 7, References, is a list of References.
- Section 8, Certifications, provides Certification Forms.

2.0 BACKGROUND

2.1 SITE DESCRIPTION

2.1.1 Site Location

The Facility, located at 125 Delawanna Avenue in Clifton, Passaic County, New Jersey (Figure 2-1) is owned by Givaudan Roure Corporation. It is approximately 31 acres and was occupied by a fragrance manufacturing facility until June 1998 when active production ceased, and former production building demolition began.

The property is bordered on the northeast by Delawanna Avenue, to the west by New Jersey Transit commuter and freight lines, to the southeast by a small medium-density housing community located on a hill overlooking the site, to the south by small businesses located on River Road, and to the southwest by River Road. The site topography slopes gently from north to south and, in general, the elevation of the perimeter of the property ranges from 1 to 25 feet higher in elevation than the rest of the site. A map depicting buildings and other site features prior to demolition activities is represented in Figure 2-2.

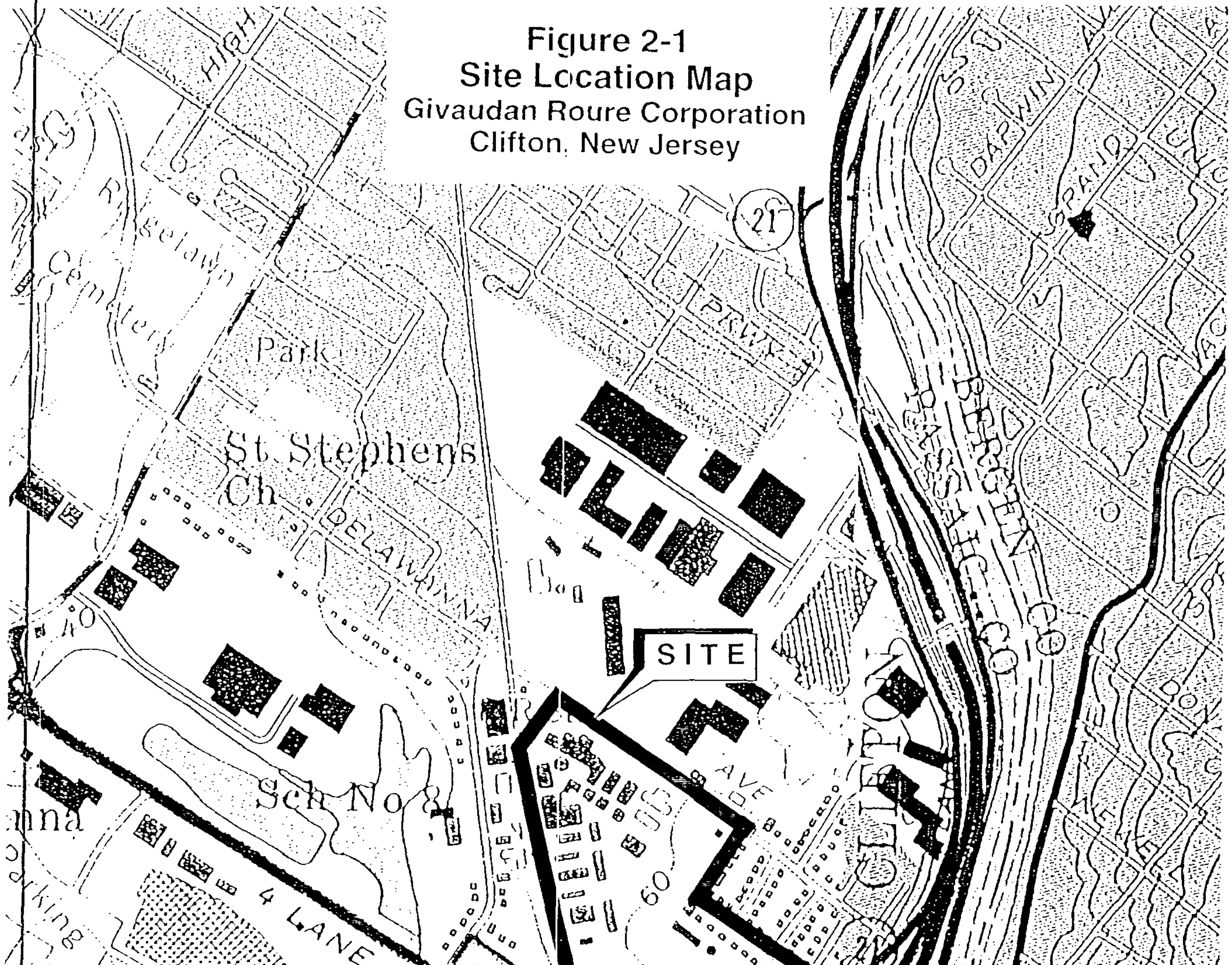
Located across the New Jersey Transit rail line to the west are buildings occupied by light industrial/commercial businesses. The Passaic River, which forms the boundary of Passaic and Bergen Counties, is approximately 0.3 miles to the southeast of the property and is tidally influenced at this location.

2.1.2 Site History

The site was an active industrial facility from 1905 until its closure in 1998. Most of the original site was owned by Antoine Chiris before its purchase by Givaudan Corporation (predecessor to Givaudan Roure) in 1913. Two other portions of the site along the southwest side of the property were owned by National Anode Corporation and Capes-Viscose Corporation. These parcels were purchased by Givaudan Corporation in 1926 and 1931, respectively (Figure 2-3).

A succession of industries has occupied the property across the railroad tracks adjacent to the west side of the site, including a Minwax Corporation plant. During its operation, Minwax used a variety of organic and inorganic chemicals, however the waste handling and

Figure 2-1
Site Location Map
Givaudan Roure Corporation
Clifton, New Jersey



Source: USGS Topographic Map, Orange, New Jersey and Weehawken, New Jersey and New York Quadrangle.

500 0 1000
Scale in Feet (Approx.)
N

ERM

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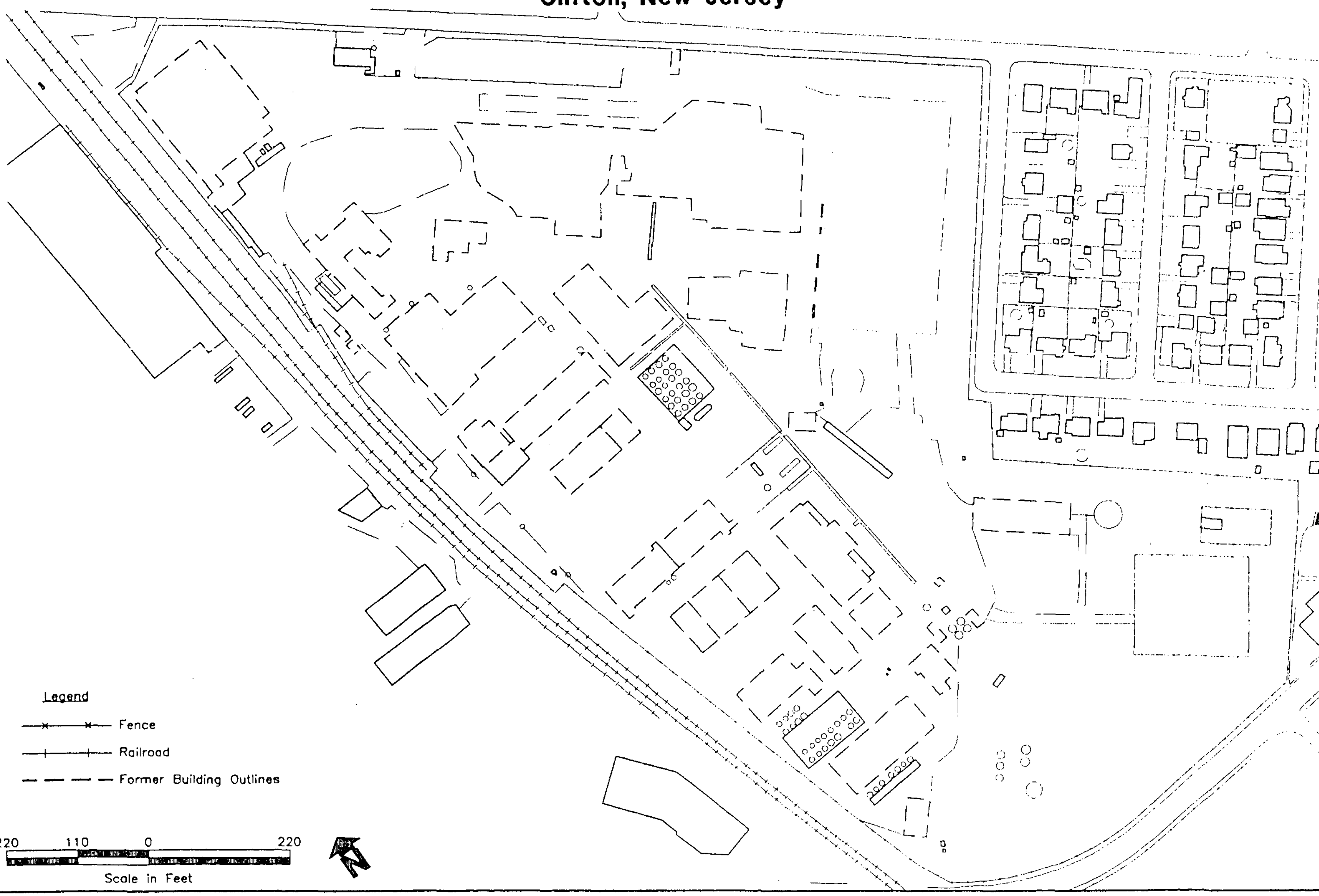
ERM

Figure 2-2
Site Plan
Givaudan Roure Corporation
Clifton, New Jersey



22323.00.01/11.03.89-SCH/01.07.00-SCH/A103-2A

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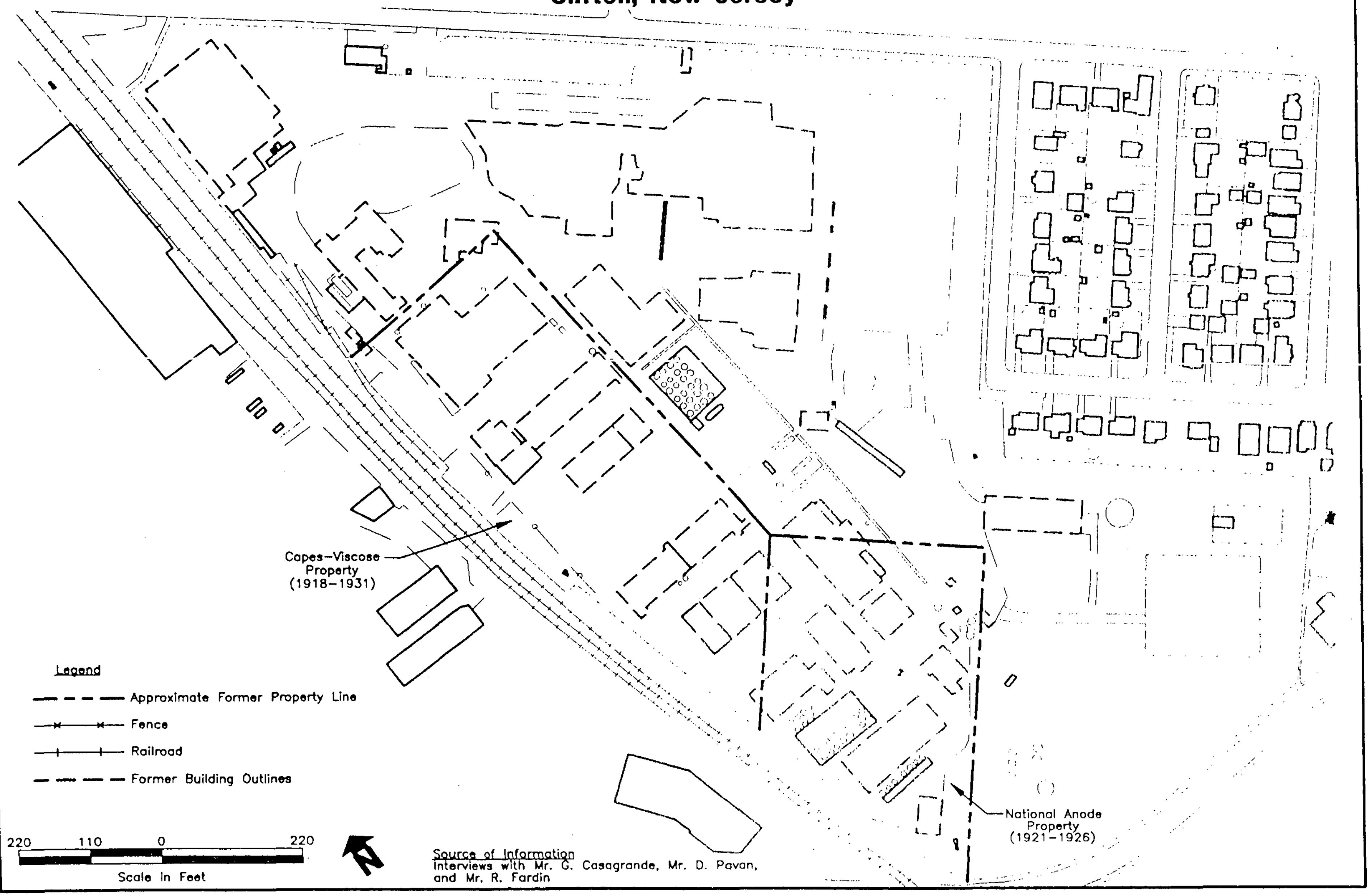
Figure 2-3
~~Site Development Map~~
Givaudan Roure Corporation
Clifton, New Jersey



ERM

22323.00.01/11.03.99-SCH/01.07.00-SCH/01.21.00-CMP/A103-1A

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disposal practices of the operation are unknown. The Minwax plant was closed in 1978 after an explosion and fire at the facility.

The first water supply well was drilled on the site in 1917. Six additional supply wells were drilled on the site by Givaudan Roure and other property owners between 1917 and 1948. From approximately 1950 to 1987 ground water was continuously extracted at the site for use as non-contact cooling water. Approximately 1 million gallons per week were extracted, utilized, and discharged to the facilities of the Passaic Valley Sewerage Commission, a publicly owned treatment works. Subsequent to 1987, the supply wells were decommissioned, and properly abandoned.

Continuous renovations occurred up until the 1998 closure as part of routine improvement and modernization programs. Environmentally related improvements included obtaining over 400 permits from the Department for air vents, which controlled process emissions. The original chemical sewer system was replaced in April 1985 with a new state-of-the-art system equipped with secondary containment. The new chemical sewer system consisted of a series of pipes constructed within concrete trenches. Gratings over the trenches allowed for physical inspection for detection of any potential loss of primary or secondary containment. A wastewater diversion system responsible for effluent water quality was also in operation for over 20 years prior to closure.

In November 1990, a steam stripper was installed for toluene distillation to comply with OCPSF regulations. In compliance with the Toxic Catastrophe Prevention Act (TCPA), a facility for storing and handling bromine was constructed in 1990. Finally, between 1993 and 1994, 52 underground storage tanks were removed and/or decommissioned.

As stated above, the plant was closed at the end of August 1998, at which time production operations ceased. Since operations ceased, the Facility has been demolished and the property is in the process of being divested.

2.2 *REGIONAL GEOLOGY AND HYDROGEOLOGY*

2.2.1 *Regional Geology*

The site is primarily underlain by the Brunswick Formation, the youngest lithologic unit of the Late Triassic age Newark Group (Table 2-1 and Figure 2-4) (Carswell and Rooney, 1976). The Newark group is contained in a southwest trending basin that reaches from Rockland County, New York, to northeast Lancaster County, Pennsylvania. The Newark Basin is the largest lobe of three valleys that run in a sinuous belt for more than

6.0 CONCLUSIONS

The remedial action objectives for the sewer decommissioning activities are presented below.

- Remove the old chemical, new chemical, and stormwater underground sewer lines, including any other encountered subsurface features identified to be historical potential source areas.
- Excavate and treat, or recycle soils impacted by the historical operation of the sewer systems.
- Backfill and compact the excavations appropriately in consideration of the future use of the property.

The remedial action performed has achieved these objectives by removing the sewers, additional subsurface features, and soil impacted by historical operations. A pilot study was implemented to evaluate treatment of excavated soils, however it was not successful.

In most cases, impacted soil was completely removed and existing concentrations of VOCs, SVOCs, and metals in soil are present at concentrations below the more stringent of the RDCSCC or the IGWSCC, or not detected. However, in some areas a decision to discontinue further excavation was made based on the field conditions.

In every instance, consideration was given to the excavated area with respect to concentrations of potentially related constituents in ground water (i.e., could the area be a residual source area for ground water impacts), sample depth, and planned future use of the property.

Provided below is a summary of the remedial action achievements from the sewer decommissioning activities.

- A total of 11,251 linear feet of old chemical, new chemical, and stormwater sewer was removed. The associated materials (piping, concrete, etc.) have been disposed of offsite, or reused onsite for backfill (if acceptable).
- Four cesspools discovered to be associated with the sewer line were removed. Based on post-excavation analytical results and the findings of other investigations completed in this area, the cesspools were determined to be a historical sources of impacts to ground water.

- One underground storage tank uncovered during the sewer removal, and four underground storage tanks found under a demolished building were removed.
- Excavation and off-site recycling of 15,602 tons of soil impacted by VOCs, SVOCs, and Metals.
- Excavation and off-site recycling of 2,559 tons of asphalt.
- Excavation, crushing, characterization, and beneficial on-site reuse of 18,692 tons of concrete.
- The removal of approximately 135,000 gallons of water from the Pond prior to excavation and backfilling.
- The complete removal of impacted sediments from the bottom of the Pond that may have been contributing to localized ground water impacts.
- The partial removal of impacted soil adjacent to the northern portion of the Pond related to the former spent acid pit.
- The advancement of 65 soil borings to address sewers that were left in place due to accessibility problems during excavation activities.
- The emplacement of approximately 24,000 tons of certified clean fill to supplement site soil and concrete acceptable for reuse in backfilling.

In summary, the proactive sewer decommissioning and additional excavation activities completed by Givaudan Roure have successfully remediated a substantial portion of the property. Through the sewer decommissioning and plant demolition activities, impacted soil was identified and removed that would likely not have been discovered if the plant was still in operation.

Areas in which organics were detected in post-excavation analytical results at concentrations exceeding the IGWSCC do not warrant additional investigation or remediation. In these areas, excavation was performed to the extent possible with considerable volumes of soil being removed. The reduction in overall mass of organics in soil should result in an observable decrease in concentrations of these organics in ground water. At a minimum, the excavation of these soil areas will serve to make any future ground water remediation (passive or active) more efficient and successful.

Areas in which soil impacts have been vertically delineated and determined to not represent a continuing source of impacts to ground water, such as in Area C, will be addressed by a deed notice on the property. Based on the comprehensive vertical delineation of impacts to soil resulting from the investigations performed to date and the intended future usage of the property as a warehousing operation with the surface paved or covered by buildings, it is Givaudan's opinion that the delineated soil impacts in Area C and other limited areas do not require additional investigation or active remeditation. In areas where a direct correlation exists between soil impacts and ground water quality such as in Areas A and B, discussed in detail in the IGWR and RAWPS, active remeditaion is proposed. To compliment any active remediation that will be performed, a Classification Exception Area will be submitted to address global ground water issues not feasibly treated by active remediation.

Appendix K
Comprehensive Analytical Results Summary

Table ...
Soil Pile Analytical Results
Givaudan-Roure Corporation
Clifton, New Jersey

		CBP-10/1-02 10/1/98	CBP-10/1-02 10/1/98	CD-01 8/18/98	CD-01 8/18/98	D''-01 BDUP 8/19/98	D''-01 8/19/98	D''-02 8/19/98
Magnesium	mg/Kg	NA	247	NA	54.1 B	NA	NA	NA
Manganese	mg/Kg	68	41.3	NA	29.6	780	680	560
Mercury	mg/Kg	130	134	NA	11.3	10 U	10 U	10 U
Nickel	mg/Kg	200	158	NA	55.8	60 U	60 U	60 U
Potassium	mg/Kg	11000	212	NA	206 B	10000	7400	6900
Selenium	mg/Kg	7 U	1.5 U	NA	3.7 U	7 U	7 U	7 U
Silver	mg/Kg	130	90	NA	0.57 B	4 U	4 U	4 U
Sodium	mg/Kg	NA	245	NA	77.0 B	NA	NA	NA
Thallium	mg/Kg	77	1 U	NA	1.2 U	2 U	2 U	2 U
Vanadium	mg/Kg	43	4 U	NA	4.1 B	55	56	59
Zinc	mg/Kg	730	558	NA	229	300	250	540
Dioxin		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	pg/g	NA	NA	NA	0.3	NA	NA	NA

Description of Data Qulaifiers is provided on page 365.
NA: Not Analyzed

J31

GIVAUDAN-ROURE

Fragrances - Specialties

September 4, 1996

Ms. Maria Franco-Spera
Case Manager
Bureau of State Case Management
New Jersey Department of Environmental Protection
401 East State Street
Trenton, New Jersey 08625

Dear Maria:

This letter is being written at the Department's request to classify 2,3,7,8 TCDD impacted soils which are presently on site and are being addressed in the Remedial Action Work Plan for On Site Containment of 2,3,7,8 TCDD Impacted Soils (RAWP) (28 August 1996) submitted to the Department on August 30, 1996

The source of the trace amounts of 2,3,7,8 TCDD has been attributed to the use of highly purified 2,4,5-trichlorophenol (TCP) for the manufacture of the bulk pharmaceutical, Hexachlorophene, USP. The manufacture of Hexachlorophene, USP was conducted on the site from the 1940's through the 1970's. (This product is no longer manufactured at this facility.)

In reviewing the applicable hazardous waste codes codified in 40CFR Part 261, it is Givaudan-Roure's conclusion that the soil containing 2,3,7,8 TCDD is not classified as a listed hazardous waste under RCRA. This determination has been made, since the most appropriate waste code (F020) contains a specific exclusion for "wastes from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol". Additionally, the soil does not demonstrate hazardous waste characteristics as defined in 40CFR261.21 through 40CFR261.24 (ignitability, corrosivity, reactivity, and toxicity).

Regards,

RECEIVED
5 1996

Leonard Levy
Director,
Site Remediation

cc: J. Christensen
M. Eversman (ERM)

LL:ms
mfs-tcp.se6

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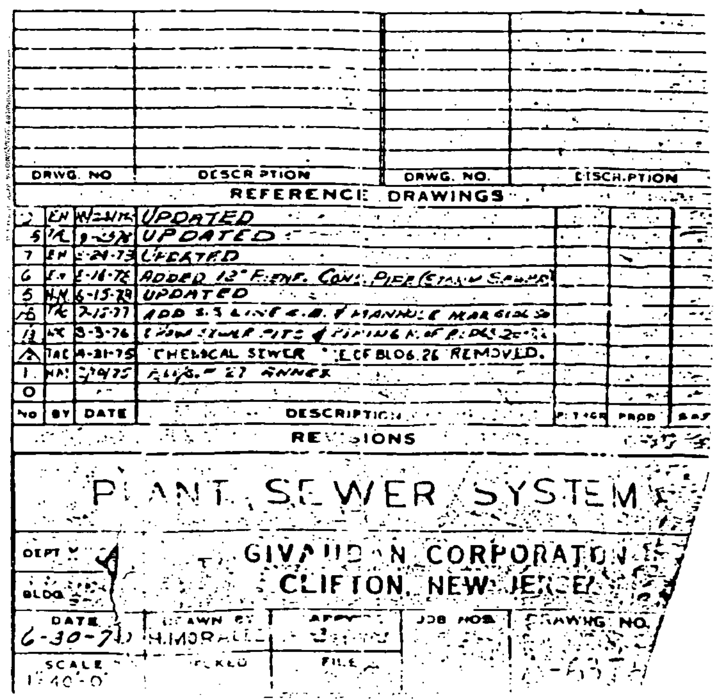
NOTICE ABOUT UNSCANNABLE MAP

THIS MAP CAN BE FOUND IN THE SITE FILE LOCATED AT: U.S. EPA SUPERFUND RECORDS CENTER, 290 BROADWAY, 18TH FLOOR, NY, NY 10007. TO MAKE AN APPOINTMENT TO VIEW THE MATERIAL PLEASE CONTACT THE RECORD CENTER AT (212) 637-4308.



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